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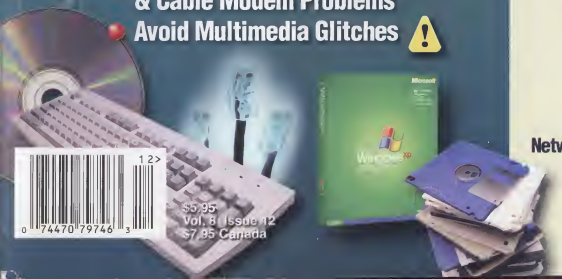

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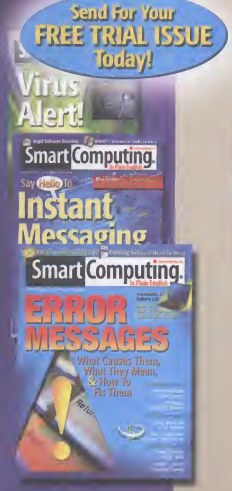

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PC Fixes

Smart Computing Learning Series
Volume 8 Issue 12

General System & Device Fixes

5 It's safe to assume that at one time or another, most PC users have experienced problems with their PCs and/or Windows. System crashes, startup and shutdown issues, hardware conflicts, and the like can really ruin your day. The good news is that with a little patience and a healthy dose of information, you can deal with the majority of these minor disasters without help from tech support people or expensive trips to the repair shop.

5 **Smooth Operation**
Regular Maintenance Keeps Your System Healthy

8 **Boot Failures & Startup Woes**
What To Do When Your System Refuses To Boot Properly

11 **Shutdown Shortcomings**
Make Your Computer Wave Good-bye

14 **End System Freezes & Lockups**
Break The Ice & Help Your Computer Recover From Frostbite

18 **A Slow Crawl**
Rev Up Your Computer & Move It Into A Faster Lane

21 **The BIOS' Role During Startup**
How The BIOS & Your PC Work Together To Control System Settings

24 **When Input Goes Kaput**
Troubleshoot Mice, Keyboards & Other Input Devices

30 **Conflicts Among IRQs & Devices**
Improve Communication & End Territorial Squabbles

33 **In Mint Printing Condition**
Bounce Back From Inkjet & Laser Printer Problems

36 **Chill Out**
Ways To Cool Off Your Overheated PC

39 **Give Your PC The Boot**
Create & Use Bootable Diskettes To Get Your System Back In Gear

41 **Check & Clean Your Registry**
It's Time To Decontaminate The Central Database

45 **Enhance Your Memory**
Experience A Massive Performance Boost For A Mere Pittance

48 **Stay Current With Windows Update**
The Easiest Way To Update Selected Operating Systems, Applications & Drivers

Software Fixes

50 We all get attached to our favorite software. Launching that word processor you've been using and upgrading for years feels almost like putting on that favorite pair of jeans that fits just right and is the most comfortable thing in your wardrobe. That's why you feel all the more betrayed when your pet program fizzles and hangs or does bizarre things to your data. Find out how to work the kinks out of a number of popular applications inside.

50 **Microsoft Office Mishaps**
Combat & Overcome Its Bad Habits

54 **Corel Office Suite Annoyances**
Solutions To The Problems That Arise In WordPerfect & Quattro Pro

58 **The Trouble With Lotus' SmartSuite**
Problems & Solutions To Help You Get The Most From The Suite

62 **When Media Players Won't Play**
Cope With Headaches Found In QuickTime, RealOne Player & Windows Media Player

66 **Reconcile Your Accounts**
Move Past Common Money & Quicken Problems

Multimedia Fixes

69 The role of PCs has changed a great deal in the last few years, and they're now doing things once left for home stereos and televisions. But a really good multimedia PC depends on lots of high-tech components to thrill you with its sights and sounds, and sometimes things go wrong. Read on to find out how to troubleshoot a boatload of common multimedia problems.

69 **Get The Picture?**
How To Fix Common PC Video Problems

72 **The Day The Music Died**
Troubleshoot Your Audio Issues

76 **Digital Camera Crises**
Deal With Digicam Troubles

80 **From The Silver Screen To Your PC**
How To Install A DVD Drive

Internet & Networking Fixes

83 The Internet and LANs (local-area networks) have changed the face of modern computing forever, but these technologies don't come without their share of headaches. We'll take you through step-by-step resolutions to some of the most vexing foibles of high-speed Internet connections, security issues, and networking snafus.

83 **Network Nuisances**
What To Do When Things Go Wrong

88 **Make A Connection**
What To Do When You Can't Access The Internet

92 **Time To Tighten Security**
Eliminate Common Holes Found In Software You Use While Online

95 **Free & Fee-Based Firewalls**
Does Everything Of Value Have A Price Tag?

98 **Minimize Spam**
Put Your Inbox On A Junk-Free Diet

101 **Somebody's Watching You**
Control Spyware & Adware

Miscellaneous Fixes

105 Some PC problems fall into a hazy no man's land that defies tidy categorization. Find out more about common problems you'll face with notebook PCs, hard drives, error messages, and PDAs (personal digital assistants), and learn how to replace or upgrade your CPU, power supply, and even your motherboard.

105 **Hard Drive Dilemmas**
Solutions To Your Startup & Performance Troubles

108 **The Dreaded Error Message**
How To Minimize The Occurrence Of Windows Errors

113 **Prevent Common Compatibility Conundrums**
Make Your Hardware & Software Run Correctly

116 **Recover Lost Data**
Applications & Tips To Protect Your Files & Information

119 **Lessen The Possibility Of Data Loss**
Back Up Your System & Keep Your Data Safe

122 **When Floppy Diskette Drives Go Bad**
Determine Whether To Update Or Replace Your Drive

125 **Notebooks Go Mainstream**
Learn How To Upgrade Your Notebook

128 **Install A New Power Supply**
What To Do If Your System Loses Power

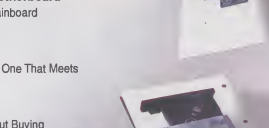
131 **How To Replace Your Motherboard**
Solutions For When Your Mainboard Gives You Troubles

134 **Pick Up The Pace**
Replace Your Old CPU With One That Meets Today's Standards

138 **Out Of Space?**
What You Should Know About Buying & Installing A New Hard Drive

142 **GLOSSARY**

143 **INDEX**



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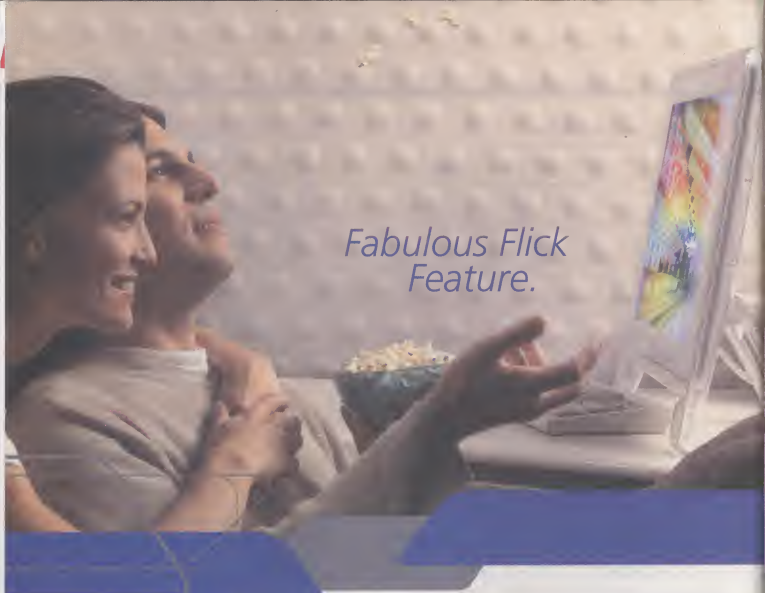

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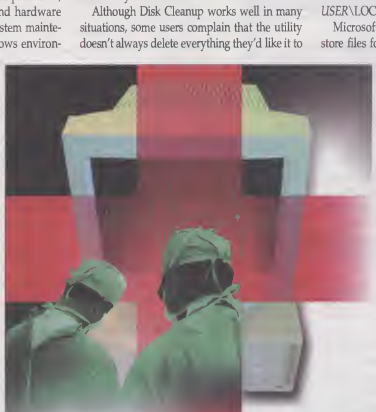
Smooth Operation

Regular Maintenance Keeps Your System Healthy

We've all heard that an ounce of prevention is worth a pound of cure, and when it comes to computers, this adage couldn't be more true. You can avoid many computer problems, including slowdowns, crashes, and hardware failures, by performing regular system maintenance. The upkeep of your Windows environment and hardware components can be almost effortless, particularly when compared to the extreme time consumption and frustration involved with solving trouble *not* maintaining your system causes.

In this article, we'll explain the necessary steps for keeping your PC clean and mean. If you have not used similar tips in the past, you're in for a big surprise because a newly cleaned system (both inside and out) can perform like it did when it was new.



Fire The Temps. If you've been a Windows user for any length of time, you know that this OS (operating system) doesn't take very good care of itself. In fact, some of its directories can become clogged with useless files that bog down your system's speed and even cause occasional crashes.

The Temp and Temporary Internet Files directories of Windows OSes aren't always so temporary, especially if you don't attend to them on a regular basis. Therefore, it's a good idea to peek inside these folders each week to see if they need cleaning. Before cleaning, always reboot your computer. Then, after your system finishes the rebooting process, don't open any programs before deleting temporary files and folders.

The easiest—though not necessarily the most effective—method for cleaning temporary directories is using Windows' Disk Cleanup utility. To access this utility, click Start, Programs (All Programs in Windows XP), Accessories, System Tools, and Disk Cleanup. This will launch a small utility window that lets you select files to delete, including temporary files, temporary Internet files, downloaded program files, and more. Place a check mark beside the items you'd like to delete and click OK.

Although Disk Cleanup works well in many situations, some users complain that the utility doesn't always delete everything they'd like it to delete. With this in mind, you should learn where these files reside and manually delete them regularly. Let's start with the Windows Temp directory. In Windows 98 Second Edition and Windows Me, you'll find it by opening Windows Explorer (right-click the My Computer icon on your Desktop and click Explore) and browsing to C:\WINDOWS\TEMP. If your Windows installation resides on a drive (or partition) other than one labeled as C:, you'll need to look on that drive.

In WinXP, Temp files exist in several locations. Along with the C:\WINDOWS\TEMP directory, you'll also find them at C:\WINDOWS\DOCUMENTS AND SETTINGS*USER*\LOCAL SETTINGS\TEMP (where *USER* refers to your username). You also might find a Temp folder in folders representing the Administrator's user profile or within the All Users folder. (Note that the Local Settings folder might reside at C:\DOCUMENTS AND SETTINGS*USER*\LOCAL SETTINGS on some systems.)

Microsoft designed the Temp directories to store files for a short time while Windows and other programs need them, but after your OS and programs finish using these files, they should automatically delete them. This isn't always the case, however, because Windows and some programs occasionally neglect to clean up after themselves. If you see files and folders in your Temp directory that you know were left there by mistake, right-click them and then click Delete.

If Windows informs you that you can't delete a file because it's currently in use, just leave it there, reboot, and try deleting the file again. If you still can't delete it, press CTRL-ALT-DELETE to see which programs are running in the background. If you have an antivirus or firewall program running, close it before trying to delete the file again.

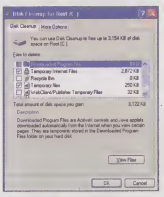
Also, we should warn you that if you select all the files and folders within a Temp directory and try to delete them, Windows might return an error message indicating it can't delete a certain file. If this occurs, write down the name of the file that Windows can't delete and select and delete the remaining files. Repeat this process until you've deleted all of the files that Windows will let you delete.

Next, let's tackle temporary Internet files. Although you can remove these files using Disk Cleanup, you also can delete them using Internet Explorer. To use the IE option, launch the program, open the Tools menu, click Internet Options, and choose the General tab. In

the Temporary Internet Files area, click the Delete Files button. If you select the checkbox next to Delete All Offline Content, the tool might delete some cookies, too, and you may not want that if you have any sites configured to automatically log you in using cookies (this also might reset other settings on these sites). Alternately, if you decide to select the checkbox to use this IE option, make sure you click OK to complete the process of deleting these files.

For future reference, you can click the Settings button in the Temporary Internet Files area (of the Internet Options dialog box) to designate the amount of hard drive space (also referred to as disk space) that Windows reserves for these files. Try setting this amount to about 10MB for the best system performance. (If you set it higher, IE won't necessarily work faster and the excess space it consumes will often be wasted.)

Although IE does a decent job of deleting temporary Internet files in Win98 SE and WinMe, it tends to have problems in WinXP. So, if you use WinXP and your temporary Internet files still remain after deleting them via IE, try deleting them manually. To find them, open the Windows Explorer window again, navigate to C:\WINDOWS\DOCUMENTS AND SETTINGS*USER*\LOCAL SETTINGS (where *USER* refers to your username), open your Local Settings folder, and open the Temporary Internet Files folder (sometimes found in a Temp folder).


Disk Cleanup for Hard Drive (C:)
Disk Cleanup
More Options
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Downloaded Program Files
Temporary Internet Files
Recycle Bin
Temporary files
WebClient/Server Publishing Temporary Files
Total amount of disk space you gain:
Description
Downloaded Program Files are ActiveX controls and Java applets downloaded automatically from the Internet when you view certain pages. They are temporarily stored in the Downloaded Program Files folder on your hard disk.
View Files
OK
Cancel

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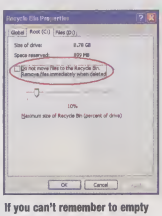


If you can't remember to empty your Recycle Bin, you can instruct Windows to permanently delete your files without moving them to the Bin.

■ Take Out The Trash.

The Recycle Bin can also grow excessively full over time, which eats system resources. You can address this problem in one of two ways, depending on what type of user you are.

If you're diligent, simply empty your Recycle Bin daily and/or after you've deleted a significant number (for example, more than 10MB) of files or folders. To empty your Recycle Bin, right-click the Recycle Bin icon on your Desktop and click Empty Recycle Bin.

If you're not so diligent, set Windows to automatically delete files permanently instead of sending them to the Recycle Bin. To do so, right-click the Bin icon and click Properties. In Win98 SE, WinMe, and WinXP, choose the Global tab and select the checkbox next to Do Not Move Files To The Recycle Bin, Remove Files Immediately When Deleted. Click OK. In all three OSes, you might find this option on the tab representing your hard drive rather than the Global tab, depending on whether you selected the Use One Setting For All Drives or Configure Drives Independently radio button.

Keep in mind that using the option to permanently delete files doesn't give you a second chance; when you delete files, you won't find them in the Recycle Bin (or anywhere else). Also, certain programs and/or activities might still send files to the Recycle Bin, so you should still empty it regularly.

You also can limit how much data the Recycle Bin holds, which helps prevent deleted files from devouring hard drive space. Adjusting the size of your Recycle Bin is useful if you tend to forget to regularly empty the Recycle Bin. On the Global tab (or the tab representing your hard drive in WinXP), set the slider between 10% and 15%. The larger your hard drive, the less percentage you should devote to the Bin. For example, if you have a 20GB hard drive and set this option at 10%, you'll be letting Windows use as much as 1GB of your hard drive just for deleted files, which is more than adequate for most situations.

■ **Defragment Your Hard Drive.** Files and folders stored on your hard drive typically appear well-organized within Windows Explorer, which might lead you to believe that your hard drive is similarly tidy. In reality, quite the opposite is often the case.

Although Windows attempts to store data in logical fashion, over time it scatters data throughout different sections of your hard drive. Known as fragmentation, this phenomenon can cause severe slowdowns in system performance because Windows must work harder to find various pieces of data. If you've ever heard your hard drive thrashing for long periods while Windows tries to perform a simple task, your hard drive probably needs you to defragment it.

Casual computer users should defragment their hard drives monthly, but if you use your computer daily, weekly defragmentation is a better idea. Because no programs (including your screen saver) should run while a utility defragments your drive(s), some users might want to set the process so it runs overnight. However, users with a regularly defragged hard drive can perform this process anytime because their drives will take less time to defragment and won't interrupt their daily activities quite as much.

Before defragging your hard drive, you should scan your drive to search for and correct any errors. In Win98 SE and WinMe, click Start, Programs, Accessories, System Tools, and ScanDisk. Select the drive you'd like to scan, select the radio button next to Standard under Type Of Test, and click Start. In WinXP, double-click My Computer, right-click the hard drive icon, select Properties, choose the Tools tab, and click the Check Now button in the Error-Checking area. Click Start in the next dialog box.

After scanning your hard drive for errors, click Start, Programs (All Programs in WinXP), Accessories, System Tools, and Disk Defragmenter. In Win98 SE and WinMe, click the Settings button and select the checkboxes next to Rearrange Program Files So My Programs Start Faster and Check The Drive For Errors. Click OK. From the Select Drive dialog box, choose the drive you want to defragment in the drop-down menu and click OK. In WinXP, simply select the drive and click the Defragment button.

When defragmentation is complete, you can close Disk Defragmenter and continue using your computer (no reboot is necessary).

■ **Shine It Up.** When your house gets dirty, you clean it. When your car gets dirty, you wash it. Why should your computer be any different? Your computer and all of its peripherals need regular cleaning because dust and grime can degrade performance and damage your valuable equipment.

Let's start with the items you handle most: your mouse and keyboard. You should clean them weekly for best results. In addition, we recommend that you shut down your computer before disconnecting the mouse to clean it.

To clean your mouse, wipe the flat surface on the bottom with a dry cloth. While you're at it, clean the dust and any dirt from your mousepad, too. (If you're using an optical mouse, obviously, the following steps aren't necessary.) Next, remove the plate on the bottom of your mouse and remove the ball. Clean the ball with a lint-free cloth and then look at the rollers inside the cavity. If you find them encrusted with grime, use a lint-free cotton swap and *slightly* dampen it with rubbing alcohol to clean the rollers. If you make the cotton swap too wet and press it against a roller, the alcohol will drip and possibly damage the internal circuitry (and if it doesn't dry before you use the mouse again, this could short out your mouse). Also, make sure the grime doesn't remain inside the mouse cavity. Replace the ball and plate when you finish.

For the keyboard, grab a can of compressed air (available at most office supply stores) and blow the air directly between the keys to remove dust and dirt. Some larger particles (such as pet hair) might still appear between keys, and you'll have to pull them out by hand. Next, use a dry cloth to dust the top surfaces. Be sure to move the dust away from the keys so you don't replace the dirt you just removed.

Now let's tackle the monitor screen, which you should clean at least once per month. The most expensive option is to use premoistened screen wipes (found at major office supply stores). A less expensive but similarly effective choice is to moisten a few plain facial tissues with 91% isopropyl alcohol (don't saturate them, though). Clean the screen just as you'd clean a window. If a film remains after cleaning the screen, moisten a few facial tissues with distilled water and rub the screen clean. Never use any ammonia-based cleaners (such as many window cleaners) because they can strip your monitor's antireflective coating.

For CD and DVD drives, you can clean the open tray with a slightly damp cloth and leave the tray open until it's dry. The lens is typically difficult to reach, and it's also extremely delicate. This component shouldn't need regular cleaning, but if you suspect that a dirty CD/DVD lens is causing poor drive performance, we recommend that you use a CD cleaning kit because manual cleaning could easily damage this lens.

In addition, you should shut down your system, unplug it, and open the computer case each month. Before you open the case, however, take the proper precautions to ground yourself to prevent static electricity discharge, which could seriously damage internal components and leave your computer inoperable.

If you haven't cleaned inside your computer case in a long time—or ever—you'll likely find a startling amount of dust coating all of the internal components, as well as the case itself. Grab that can of compressed air and blow all of the dust out of the case. Be sure to reach every imaginable spot, including the top of hard drives, case fans, and even the fans in your power supply (but don't place the air nozzle in the power supply itself). Also clean out the area between the motherboard and the case. If any dust remains after using the compressed air, use a soft, dry, lint-free cloth to remove it.

If your CPU's heat sink has a fan, you can use the compressed air to blow dust from it, but the most effective procedure is to remove the heat sink altogether (which likely means removing the entire CPU/heat sink/fan combination) and clean the fan. However, if you've never removed internal components from your PC's case and are not comfortable doing so, we recommend that you only use the compressed air as an option.

If you decide to remove the entire CPU/heat sink/fan combination, use dry cotton swabs to remove the built-up dust and hair from all of the fan's blades. You can repeat this process on case fans if they're similarly dirty, but heat sink fans are the ones that tend to accumulate more grime.

■ **Check For Updates.** To keep your computer in peak condition, it's smart to check for Windows and virus definition updates on a monthly basis.

To update Windows and other Microsoft products, click Windows Update from your Start menu (or visit http://windowsupdate.microsoft.com) and click Scan For Updates. Download and install any recommended updates for your system. In WinXP and WinMe, you can configure settings so updates automatically download and/or install as needed For more information, see "Stay Current With Windows Update" on page 48.

Most antivirus software also has automatic updating features, but if your software doesn't, consult its manual or Help files to determine how to update your program. In addition, you can typically visit the software company's Web site to download updated virus definitions.

■ **Get Out The Elbow Grease.** As witnessed, regular computer maintenance is simple and well worth the effort if you appreciate a fast, trouble-free system (and who doesn't?).

Don't wait until your system performance degrades before you implement routine maintenance tasks. Computers are intricate machines that need constant care, and if you don't provide it, they'll complain in several nasty ways.

Include computer maintenance tasks in your schedule just as you'd include exercise for your body and oil changes for your car. You and your computer will appreciate the results. LS

by Christian Perry

Maintenance Checklist

For best results, follow our simple checklist to make sure your system stays in tip-top shape and runs as well as the day you purchased it.

Daily	Weekly	Monthly
Empty Recycle Bin	Delete temporary files from Windows, programs, and Internet use	Defragment hard drive (casual computer use)
	Defragment hard drive (heavy computer use)	Clean monitor screen
	Clean mouse	Clean inside computer case
	Clean keyboard	Use Windows Update
		Update virus definitions

Boot Failures & Startup Woes

What To Do When Your System Refuses To Boot Properly

From the end user's perspective, booting the computer is a cinch. Just push the power button, turn on the monitor, and wait a few seconds for the Windows Desktop to appear on-screen. The simplicity of the task, however, belies the complex activity taking place inside the PC. Within seconds of pressing the power button, the **BIOS (Basic Input/Output System**; software that controls the startup routine) has given the computer a thorough examination, inventoried system memory, initialized all of the system components, and launched the OS (operating system). That's a lot of commotion in a short period of time. It's no wonder problems occur.

Startup problems come from a variety of sources, including outright hardware failure, software and hardware compatibility conflicts, corrupt system files, memory shortcomings, and viruses. Some of these problems will cause your computer to play dead. Other problems wait to manifest themselves until after the startup routine is underway. Some problems are the result of user errors; others are due to forces beyond the user's control. All are a nuisance.

Your response should be the same in each case: Take stock of the situation to determine what actually happened and then run through a checklist of common causes to identify the likely source of the problem.

■ **Is It Alive?** Perhaps the greatest fear of any computer user is that the PC will fail to respond when he pushes the power button. Fortunately, a computer that looks dead may have a lot of life left in it.

The first thing to do in such a situation is check the PC's power cord to make sure it's plugged in to both an electrical outlet and the back of the computer. You also should make sure the electrical outlet has electricity flowing to it. Your PC will not work if it's connected to a malfunctioning UPS (uninterruptible power supply) or a power strip someone turned off. Ditto if your electrical box is hiding a broken circuit breaker or if your neighborhood is in the midst of a power outage. If you're trying to boot a notebook computer, plug in the AC adapter and see if that helps. You may just need to recharge a dead battery.

Assuming you plugged the computer into a live power source, the next step is to make sure the power supply is set for the correct voltage. You can do this by turning your computer around and locating the voltage switch (you'll find it in the same area where the power cord plugs into the PC). The switch has two settings: 230 or 115 (on some PCs, the settings are 220 and 110). It should be set to 115 (or 110) if you live in the United States or Canada. Your computer will not work if the voltage setting is configured for 230 volts.

Finally, check the PC to ensure that its integral components, including the motherboard, processor, and power supply, are still working. If you recently upgraded any of these components, make sure you installed it (or them) correctly. Open the cover of your computer case and look for loose cables, an improperly seated processor, and cracks or breaks in the motherboard. You also should check to see whether any of the system's data cables (flat, gray ribbon cables that connect the motherboard to storage drives inside your PC) are pressing against the motherboard with enough force to dislodge any of the board's delicate components.

If you don't spot any obvious problems and the computer is still not working, you probably have a dead power supply, processor, or motherboard on your hands. Determining which of these components is at fault is a tedious task. We suggest that you contact the manufacturer for assistance. Hopefully your PC still has coverage from its warranty.

■ **Just Getting Past Go.** Most boot failures occur after the computer has already initiated a startup sequence. You press the power button, the computer hums, the monitor lights up (or not), and then you're hit with an error message that brings your computing plans to a sudden halt. In most cases, the error messages are indecipherable and you're left with few clues to determine where things went wrong. Your best bet is to systematically review the situation to deduce where the problem started.

User errors. First, eliminate all of the user-induced errors. Did you leave a nonbootable diskette in the floppy diskette drive? This will produce an "invalid system disk" or "nonsystem disk" error message. Are you trying to log

on to someone else's computer and don't have the password (or did you type the wrong password while logging in to your own computer)? Doing so will stop you cold at the login screen. Is the monitor turned off or configured incorrectly? Your computer may boot properly but you won't know it if someone turned the Brightness setting to zero.

Compatibility conflicts. Next, ask yourself if you made any significant changes to the system since the last time you booted it. Specifically, did you install any new hardware or software? If so, your system may be experiencing a compatibility conflict between the newly installed peripheral or program and the rest of the components. Before you start panicking, keep in mind that conflicts like these are common. When you stop to consider just how much hardware and software must work together to make your PC function properly, it's easy to see how compatibility conflicts can occur.

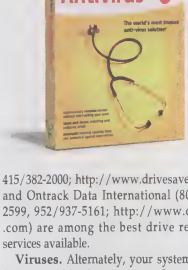
The bad news is that compatibility conflicts reveal themselves in a variety of different error messages, each particular to the program or peripheral involved. The good news is that you can work around the majority of these conflicts by closing the error message, thereby gaining access to your system, and then downloading a **driver** (software that helps a hardware component communicate with the rest of the system) or **patch** (code designed to fix a known software problem) from the Web site of the software developer or hardware manufacturer that produced the errant product. Look for a link to the site's Downloads or Support area, either of which should provide a list of downloadable drivers and updated patches.

In a worst-case scenario, you may need to upgrade the troublesome product or remove it from your computer entirely. Before doing that, though, you should double-check the hardware installation (look for loose cables and improperly seated expansion cards) or reinstall the software. Either of these simple solutions could do the trick.

Hard drive hardship. If your computer is the same as it's always been, with no significant changes in recent days, the problem probably lies elsewhere. The next thing you should do is determine whether you're dealing with a hard drive problem. Like other electronic equipment, hard drives have a limited life span. You can tell when they reach the end of that life span because the computer cannot complete its boot sequence and a "Boot Failure" or "Non-System Disk" error message appears on-screen.

To determine whether the hard drive is the source of your boot woes, start with the obvious. The failure may be due to a loose connection between the hard drive and the data cable or the data cable and the motherboard. Consult the users manual and then check under the hood to find out if this is the problem.

If not, you may be dealing with a mechanical malfunction. In this case, your first thought should be to secure your data. Figure out when you made your last backup (you have a backup routine, don't you?) and, if necessary, contact a drive recovery center immediately. The fate of the data you did not back up rests in the hands of these experts. DriveSavers Data Recovery (800/440-1904, 415/382-2000; http://www.drivesavers.com) and Ontrack Data International (800/872-2599, 952/937-5161; http://www.ontrack.com) are among the best drive recovery services available.



Regular use of an antivirus utility, such as Norton AntiVirus from Symantec ($49.95; http://www.symantec.com), makes it easy to avoid the type of viruses that will destroy your master boot record.

Viruses. Alternately, your system's boot failure could be due to a virus. Some viruses can infect and corrupt your system's **MBR** (**master boot record**; a small program that tells the BIOS where to find the OS on the hard drive). When that happens, your system's hard drive becomes effectively useless because the BIOS doesn't know how to launch the OS or access any data.

If you suspect this is the problem—and it may be if you recently opened a file without scanning it for viruses or if you downloaded files from a disreputable source—you should contact an antivirus software developer, such as Symantec (800/441-7234, 408/517-8000; http://www.symantec.com) or McAfee.com (subsidiary of Network Associates; 888/847-8766, 408/992-8100; http://www.mcafee.com), and request a bootable diskette.

System file corruption. What if a single file on the hard drive is the source of the problem? The corruption of a key system file, such as Kernel32.dll or System.ini, can put the kibosh on your startup routine. This is especially true for users of Windows 98 Second Edition and Windows Me, both of which lack the stability of Windows XP. You can assume that corruption of a system file is the source of your startup woes if you receive an error message that makes reference to a particular system file, mentions a problem with a **VxD** (**virtual device driver**; a program that handles communication between a hardware component and several applications), or includes the word "kernel" in its description.

The solution in all cases is to replace the corrupt file or reinstall the OS. Replacing a corrupt file is a quick and adequate fix, but doing so requires you to know where a clean version of the corrupt file is (usually on the Windows installation disc) and how to install the file on your system without putting any of your data files at risk. Reinstalling the OS, on the other hand, is a simple matter of putting the installation CD-ROM in the disc drive and following the on-screen installation instructions. Reboot the PC when you're through to see whether this solution solved the problem.

For additional assistance, contact Microsoft's technical support (425/635-7222 for help with Win98 SE; 425/635-3311 for help with WinMe or WinXP) or visit the Microsoft Product Support Services site (http://support.microsoft.com).

Too much or not enough memory. Another problem that might prevent you from booting the computer is a shortage or overabundance of memory. Interestingly, both situations will result in an "Insufficient Memory" or "Not Enough Memory" error message. You can determine which is the problem by reviewing your product documentation to see how much memory your system has installed.

To minimize memory-related errors, we suggest that your PC have at least twice

as much RAM as your OS requires. For example, the computer should have at least 48MB of RAM if it runs Win98 SE, 64MB if it runs WinMe, and 128MB if it runs WinXP. Your PC also should have no more than 512MB of RAM if you use Win98 SE or WinMe. The way Microsoft originally designed these OSes prevents them from accessing more than that and leads to insufficient memory error messages.

It isn't pretty, but hey, it works. Safe Mode lets you access the core functionality of your OS (operating system) when you can't get Windows to start.

If your PC has an appropriate amount of memory and still continues to produce insufficient memory errors, then the cause is probably a malfunctioning **memory module** (a circuit board that is laden with memory chips and plugs into the motherboard). Contact your PC manufacturer or look in the users manual to determine what type of memory modules your system uses and how to replace them. If you have multiple memory modules, you can pinpoint which module is defective by removing one of the modules and restarting your system. If the computer still has problems starting up, replace the memory module and remove another module. Repeat the process until you isolate the defective module. However, do not attempt to remove the modules if you have little or no experience at adding or removing hardware components.

The monitor. It is possible that the startup problem you're experiencing isn't caused by the computer at all but rather by a faulty monitor. This is most likely the case if the computer is receiving power, as indicated by its glowing power light, but the monitor's screen stays dark. To resolve the situation, you should make sure the monitor is plugged in, connected to the computer, and has its settings configured properly.

If you take these preliminary steps and still can't see a thing on-screen, then you might need to replace the monitor (monitors are among the first components to wear out on any system). Before buying a new one, however, you should try plugging the monitor in to another computer to see whether it works there. This will help you figure out whether the problem lies with the monitor or with the video card. If the monitor works flawlessly with another computer, then you should replace your system's video card instead.

■ **Take Measures To Protect Yourself.** Of course, the worst time to think about a boot failure is when it actually happens. You can minimize the stress and expedite the remedy by acquainting yourself with some of the tools and resources that can ease the process of recovery.

First and foremost, you should establish a regular backup routine. Make a daily copy of all mission-critical data files and store that copy in a safe location. Few startup problems pose a serious threat to your data, but those that do—namely, a malfunctioning hard drive or virus—have the potential to destroy your important documents, financial records, contact information, digital photos, and other priceless content.

Secondly, you should learn how to start your OS in Safe Mode. Safe Mode is a barebones operating mode in Windows that lets you access the OS' core functions in situations when you are unable to access the OS normally. You can access Safe Mode in Win98 SE, WinMe, and WinXP by repeatedly pressing the F5 key while booting the computer. You also can access it by holding down the F8 or CTRL key while starting the PC. If the Windows Startup Menu or Windows Advanced Options Menu appears on-screen, choose the Safe Mode option. When Safe Mode starts, the Desktop will look slightly different, but you will be able to access the Control Panel, My Computer, and other tools that can help you diagnose and resolve your boot problem.

The third resource you should have handy in case of a boot failure is a bootable diskette. A bootable diskette is a 3.5-inch floppy diskette that, when inserted into the diskette drive at the time you start your computer, will take you to a command prompt. You then can access the contents of your hard drive, replace or fix corrupt files, execute DOS commands, and take steps that might help you resolve the boot failure. For more information, see "Give Your PC The Boot" on page 39.

■ **A Boot To Remember.** Armed with a bootable diskette, access to Safe Mode, and an understanding of the common causes of boot failures, you can take confidence in your ability to handle almost any startup problem that comes your way. And sooner or later, one will. LS

by Jeff Dodd

Coming Out Of Hibernation

Although the process of bringing your computer out of Hibernate or Standby mode isn't technically a **boot** (to start a computer), it's still prone to its share of problems.

For instance, perhaps the computer refuses to come out of the Hibernate mode, or maybe a hardware device or program acts funny after it does. Whatever the case, you can remedy most Hibernate and Standby problems by completely shutting down the computer and restarting it after a short break (to shut down a computer that has locked up, press and hold in the power button for several seconds). If that doesn't resolve the situation, contact the developer or manufacturer of the troubled software or hardware. Odds are good that a downloadable **driver** (software that helps a hardware component communicate with the rest of the computer system) or **patch** (code inserted into software to fix a known problem) will clear things up. ■

Shutdown Shortcomings

Make Your Computer Wave Good-bye

Most computer users don't ask for much: a fast Internet connection, intuitive software, and an effortless shutdown. And yet, time after time, they find themselves waiting for files to download, reading undecipherable users manuals, and holding in the computer's power button because the computer won't shut down on its own. Yes, shutdown snags are still far too common today.

First Steps. Perhaps the most frustrating aspect of any shutdown problem is that it occurs when you're trying to get away from your computer. You might be rushing out for an important appointment, leaving the office after a day at work, or simply getting ready for bed. Whatever the situation, you probably have neither the time nor the energy to figure out what went wrong. All you want to do is turn off the darn PC.

And why not? How can you possibly troubleshoot a technologically complex device when you're tired or worn out or something else is distracting you? Considering the circumstances, we suggest that you take a few seconds to write down a detailed description of the problem, including the text of any error messages that appear on-screen. Then, manually power down your computer by holding in the computer's power button until the system shuts down (you may have to hold the button in for as long as 15 seconds). Once that's out of the way, you can push the shutdown difficulty to the back of your mind until you have adequate resources, including time and patience, to handle it.

Don't let the shutdown episode remain at the back of your mind for too long, though. The best time to resolve a shutdown issue is while it's still fresh. Shutdown problems have many causes, ranging from **driver** (software that helps a component communicate with the rest of the system) conflicts and incompatible **BIOS** (Basic **Input/Output System**; software that controls a computer's startup procedure) settings to corrupt sound files and programs that fail to close properly. Figuring out the cause of your problem requires a thorough assessment of the situation, paying special attention to any recent changes to your system.

You may not be able to perform this type of an assessment if you let weeks or months pass since the trouble began.

In any case, the first time you use your computer following a shutdown problem, you should do four things: clean up the hard drive, restore your system to a previous configuration, update the hardware drivers, and download the most recent Windows updates and software **patches** (code designed to fix a program's known shortcomings).

Clean up the system. A convoluted hard drive can wreak all sorts of havoc with your computing experience. Before you start making significant changes to your system in an attempt to pinpoint the source of your shutdown problems, take the simple step of cleaning your hard drive.

For one thing, empty the Temp folder (generally in the C:\WINDOWS directory) of all files bearing the .TMP file extension. And while you're there, empty out the Temporary Internet Files folder, too, and run the drive maintenance utilities while you're at it. You can access the maintenance utilities by opening My Computer, right-clicking the **Windows drive** (the drive where Windows is installed), selecting Properties from the pop-up menu, and choosing the Tools tab from the dialog box.

Restore a configuration that works. If your computer has no history of shutdown problems and you recently changed the system settings, you may be able to resolve the shutdown snag by restoring the computer to a previous configuration. The System Restore feature in Windows Me and Windows XP can help you do that. You'll find the System Restore utility by opening the Start menu and clicking Programs (All Programs in WinXP), Accessories, and System Tools.

In the System Restore dialog box, select the Restore My Computer To An Earlier Time option and click Next. Then, highlight the date when you most recently shut down your computer without encountering a shutdown problem. A list of corresponding restore points for the selected date will appear next to the calendar. Select the latest restore point (called a System Checkpoint) available to you and click Next. A message indicating that you should save all unsaved files and close any open programs may appear on-screen at this time. Click OK to close the message.

The final screen in the System Restore dialog box asks you to verify that you want to restore your system to the selected restore point. Click Next to complete the process. After your computer restarts, use the Windows Shut Down menu to turn off your computer. If your PC exits flawlessly, you obviously resolved the problem.

Update the hardware drivers. Of course, another thing you should do whenever your PC acts strange is update its drivers. These mini-applications facilitate communication between individual hardware components and the rest of the PC. If a driver becomes outdated, as may happen when you add a new peripheral to the PC, communication may fail and problems may arise. One potential problem is a shutdown failure. Replacing an outdated driver with a new one essentially reopens the lines of communication so that your computer can run smoothly again.

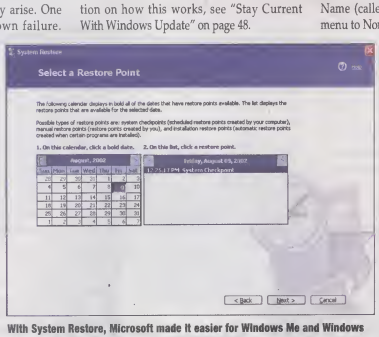
You might be able to identify a troublesome driver by looking in the Device Manager. To access the Device Manager, right-click the My Computer icon (you'll find it on the Desktop in Windows 98 Second Edition and WinMe and in the Start menu in WinXP) and select Properties from the pop-up menu. In the resulting dialog box, choose the Device Manager tab (in Win98 SE and WinMe) or Device Manager button (you'll find it on the Hardware tab in WinXP).

When the Device Manager opens, review the list of components; the ones that have a black and yellow icon of an exclamation point next to them probably need an updated driver. If you don't see an exclamation point icon next to any of the components listed, you should update all of the drivers.

Updating a driver is usually as easy as contacting a device manufacturer. Most hardware manufacturers post downloadable driver updates on their Web sites. We suggest that you update your drivers once every six months or whenever you add a new component to your system. In most cases, the drivers will install themselves automatically when the download is complete.

Download patches. Software developers often release products that have bugs (program flaws) in them. To fix these minor problems, the developers post patches and updates on their Web sites. As with drivers, you should search for patches and software updates at least once every six months or whenever you install new software on your system.

In addition, visit the Windows Update site (http://windowsupdate.microsoft.com; you can also click its icon from your Start menu) at least once a month to download and install Windows updates as they become available, especially the ones Microsoft labels as critical updates. WinXP and WinMe users have the option of streamlining this process so updates automatically download and/or install as they become available at the site. For more information on how this works, see "Stay Current With Windows Update" on page 48.


System Restore
Select a Restore Point
The following calendar displays in bold all of the dates that have restore points available. The list displays the restore points that are available for the selected date.
Possible types of restore points are: system checkpoints (scheduled restore points created by your computer), manual restore points (restore points created by you), and installation restore points (automatic restore points created when certain programs are installed).
1. On this calendar, click a bold date.
2. On this list, click a restore point.
August, 2002
Sun Mon Tue Wed Thu Fri Sat
28 29 30 31 1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31
1 2 3 4 5 6 7
Friday, August 09, 2002
12:29:41 PM System Checkpoint
< Back
Next >
Cancel

With System Restore, Microsoft made it easier for Windows Me and Windows XP users to resolve shutdown (and most other) problems. Simply run the utility to return your computer to a time when it shut down without a hitch.

■ **Dig Deeper.** The preceding four steps will fix many—but not all—of the shutdown failures you are most likely to face. If your PC continues to stall whenever you try to turn it off, you should focus your attention on some particular causes.

A faulty software installation. A software installation involves the transfer of millions of bytes of data from one location (the installation disc) to another (the hard drive). If a few of those bytes have trouble making the transfer, your computer may not shut down properly. To fix any shutdown problems that crop up shortly after the installation of a new program, you should remove the program from your PC and then reinstall it. That might be enough to fix the problem.

A corrupt Exit Windows sound file. As funny as it seems, your shutdown failure may be the result of a corrupt Exit Windows sound file. In this scenario, your computer attempts to access the sound file and, apparently petrified by the corruption it finds there, locks up or malfunctions. This is an easy problem to identify, though.

From the Control Panel (found on the Start menu), double-click the Sounds icon in Win98 SE, the Sounds And Multimedia icon in WinMe, or the Sounds And Audio Devices icon (in the Sounds Speech And Audio Devices category) in WinXP. From the resulting dialog box, choose the Sounds tab and highlight Exit Windows in the list of sound events. Set the Name (called Sounds in WinXP) drop-down menu to None and click OK to save the change and close the dialog box.

After closing any open windows and/or programs, try to turn off your computer. If the computer shuts down without demonstrating a problem, you probably found the cause. Delete the corrupt Exit Windows sound file from your hard drive (most likely in at C:\WINDOWS\MEDIA).

Incorrect configuration of your antivirus software. Another likely cause of shutdown failures is an antivirus utility configuration that conflicts with the Windows OS (operating system). This type of problem is relatively common among users of the Win98 SE and WinMe OSes. For instance, the computer may freeze or generate an error message because the antivirus utility attempts to scan the diskette drive as the computer tries to shut down. Or, perhaps it's because the antivirus utility enables its email protection feature as the computer tries to shut down.

Unfortunately, you may not be able to decipher the specific cause of such a problem because the computer simply locks up or presents a vague Windows Protection Error message without indicating the root of the error. Your best bet is to check with your antivirus software developer to determine whether your shutdown failure matches the description of a problem that the antivirus utility might have caused. If it does, ask the software developer for the fix.

An enabled APM (Advanced Power Management) specification. Under normal circumstances, Windows installs the ACPI (Advanced Configuration and Power Interface) specification to govern power management on your notebook computer. Some computers cannot handle ACPI, though, and that's when Windows installs the APM specification instead. Such a switch is acceptable and usually

goes off without a hitch, but it does raise the likelihood of a shutdown failure. If you use a notebook and have trouble shutting it down, you should check to see whether APM is active on your system and, if it is, disable it.

To access the power management features, open the Device Manager and double-click System Devices. A list of system devices will appear in the dialog box; look for one labeled Advanced Power Management or APM. If you do not see it, your PC doesn't have APM installed, and you can eliminate it as the cause of your shutdown failure.

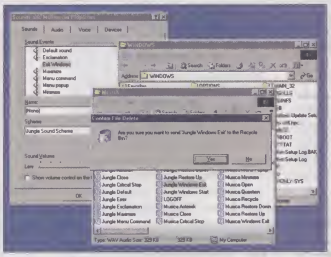
If you do see an entry for APM, however, you should double-click it and select the Settings tab in the resulting dialog box. Select the Force APM 1.0 Mode and Disable Power Status Polling options so that a check mark appears next to them. Click OK to save your changes and return to the Device Manager. Click its OK button and then reboot the computer. After the computer starts, shut it down. If the shutdown goes smoothly, you identified the cause.

The final thing you should do is contact the computer manufacturer and request a BIOS update that supports APM. The manufacturer will probably direct you to a Web site where you can download the update.

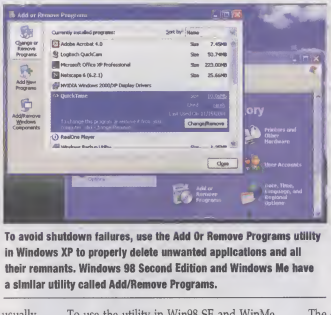
Traces of deleted program(s) remain on the system. Some users make the mistake of using the DELETE key to remove unwanted programs from their systems. These users see a folder on the hard drive labeled with the name of the undesirable application, so they delete it and assume the program is gone for good. Boy, are they wrong.

A typical program installs most of its files in a common location, which is usually a labeled folder on the hard drive, but it also installs bits of code in the Registry (a database of user preferences and system settings), throughout system files, on the Start menu, and in other folders on the hard drive. When a deficient program uninstallation method leaves these program remnants behind, they frequently cause error messages, system lockups, and shutdown failures.

If you suspect that a deleted program is at the root of your shutdown woes, you should reinstall the program and use the Windows uninstall utility to remove it from your computer. To access this utility, open the Control Panel and double-click the Add/Remove Programs icon (in Win98 SE and WinMe) or the Add Or Remove Programs icon (in WinXP).



If a corrupt Exit Windows sound file prevents your computer from shutting down properly, change the Exit Windows setting to None and delete the corrupt sound file from your hard drive.



To avoid shutdown failures, use the Add Or Remove Programs utility in Windows XP to properly delete unwanted applications and all their remnants. Windows 98 Second Edition and Windows Me have a similar utility called Add/Remove Programs.

To use the utility in Win98 SE and WinMe, choose the Install/Uninstall tab of the Add/Remove Programs Properties dialog box. A list of the programs installed on your computer will appear at the bottom. Locate the unwanted program, highlight it, and click the Add/Remove button. When Windows asks whether you want to remove the program, click Yes or Uninstall (the command will differ among programs) to continue.

To use the utility in WinXP, click the Change Or Remove Programs button in the dialog box and review the list of currently installed programs. Find the unwanted program in the list, highlight it, and click the Remove or Change/Remove button. Verify that you want to remove the program and click the button (usually labeled Yes, but it may be labeled Uninstall or something similar) that lets you proceed with the uninstallation process.

Either way, close any dialog boxes that remain on-screen after you finish the uninstallation process and shut down your PC. Hopefully, the shutdown procedure will now run as it should.

A corrupt or incorrectly configured BIOS. Although rare, a corrupt or incorrectly configured BIOS could cause your PC to experience shutdown failures. The only way to determine whether this is the source of your problems is to contact the computer manufacturer and ask for assistance in repairing or replacing the BIOS.

The manufacturer may not be very excited about helping you, especially if your PC has outlived its warranty period, but at this point, anything is worth a try. If nothing else, perhaps the support technician could run some system-specific diagnostic tests to identify the reason your computer doesn't want to shut down.

■ **Your Last Resort.** If you try all of the options we suggest and continue to have trouble with your computer's shutdown procedure, you may want to reinstall Windows. Doing so gives your OS the chance to flush out corrupt system files and replace the missing code that may be the root of the problem.

The easiest way to reinstall Windows is to insert the installation CD-ROM in the disc drive and reboot the computer. Follow the on-screen instructions just as you would if you were installing the OS from scratch. When the installation is complete (it won't take too long because most of the files are already in place on your hard drive), reboot your computer and keep your fingers crossed. The fate of a new generation of system shutdowns is at stake. LS

by Jeff Dodd

End System Freezes & Lockups

Break The Ice & Help Your Computer Recover From Frostbite

Welcome to the Lockup Diner, where each day we serve heaping plates of computing frustration. Today's special is Frozen Mouse Cursor. Tomorrow we're featuring No Keyboard Response. And don't miss this weekend's All-You-Can-Eat Reboot Buffet!

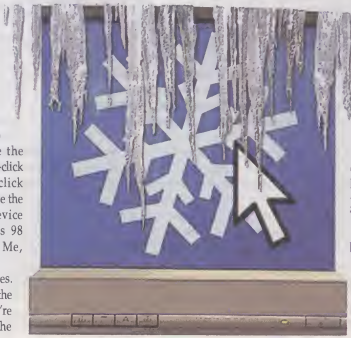
Doesn't sound very appetizing, does it? Many of us have experienced the stomach-churning sensation of a frozen workspace. And although this sensation is most severe when it happens in the middle of a project, lockups can even occur when you're *not* doing anything on the computer. These errors can be difficult to track, but you can usually identify one or more of several likely culprits in most lockup situations. Let's take a look at what they are and how to solve them.

■ **Update Your Drivers.** In many ways, hardware drivers are the lifeblood of your PC; without them, your devices wouldn't run. But drivers can become outdated over time, and when that happens, your devices might have trouble handling new software and utilities. Crashes and lockups are obvious signs of outdated drivers, so if you're not in the habit of updating them, now is a good time to start.

The easiest, though not necessarily the most effective, way to update your drivers is to use the Windows Device Manager. Right-click the My Computer icon and click Properties. In Windows XP, choose the Hardware tab and click the Device Manager button. In Windows 98 Second Edition and Windows Me, choose the Device Manager tab.

Here, you'll see a list of devices. Although you can try to update the drivers for all of your devices, you're better off initially focusing on the devices that historically cause the most problems, such as the video card and sound card. Expand the branch for each device (one at a time), double-click the device listed, and choose the Driver tab. Click the Update Driver button, which will prompt Windows to ask you where you want the new driver before it searches for one. If you ask Windows to install the driver automatically (or select the Search For A Better Driver Than The One Your Device Is Using Now option in Win98 SE, or the Automatic Search For A Better Driver option in WinMe), the utility will search through its system files and the Microsoft Web site, so make sure you're already connected to the Internet.

Any driver found in your system files is likely to be as old as (or older than) the driver your device is currently using, but any driver the utility downloads from Microsoft's site is typically up-to-date. If the utility finds a newer driver, install it and see if your system lockups cease. If they don't, you'll need to do some Web surfing of your own to find better drivers.



Many device manufacturers update their drivers on a regular basis and provide them as free downloads from their sites (usually in sections named Downloads or Support). In general, downloading drivers from the Web is your best bet because even if Microsoft has updated drivers for your device, some manufacturers release even newer drivers by the time Microsoft certifies the previous drivers via its rigid driver-testing program.

If you're not sure where to look online for device drivers, visit PC Drivers HeadQuarters' Drivers List page (http://www.driversheadquarters.com/Main.asp), Windows Driver Guide (http://www.winguides.com/drivers), or Driverzone.com (http://www.driverzone.com/search.htm). These sites provide search tools to help locate drivers from major device manufacturers, so as long as you know the make and model of your device, these sites can point you in the right direction to download the drivers you need.

■ **Tame Your Power Management.** The APM (Advanced Power Management) features of Windows help conserve energy and decrease wear and tear on certain hardware components. Although APM performs adequately on many systems, some users complain that Windows can become stuck in Standby or Hibernate mode, often requiring a full reboot to return to live-action Windows.

If your lockups occur while trying to wake up your computer from a state of hibernation, you'll need to do some APM troubleshooting. First, reboot your computer and enter your BIOS (Basic Input/Output System) setup utility by repeatedly pressing the F1, F10, DELETE, or ESC keys on your keyboard when the first boot screen appears on your monitor. (If none of these keys summon the BIOS, check your users manual.) If you see a splash screen display your computer manufacturer's logo instead of the initial boot screen, you can usually bypass it by pressing TAB as soon as you see it.

Once you're in the BIOS setup utility, be careful not to make any changes unless you're sure of their outcome. Bad settings in your BIOS can render your system unstable or even unusable. Scroll through the different pages of your BIOS setup utility using

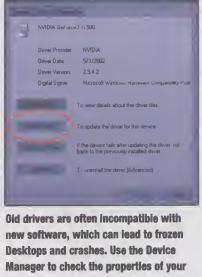
the TAB or arrow keys on your keyboard (or whatever your BIOS setup utility suggests you use for navigation) until you find a setting for APM. Set this option to Enable or On. You should also set any similar power management options to Disabled or Off so Windows retains full control of your computer's power management. Save your changes when you exit the BIOS. (You'll see an option similar to Save Changes and Exit BIOS.)

You also can remedy APM problems by updating your video driver (see the previous section in this article for instructions). If you're still having trouble with system freezes, try to disable your nonessential hardware devices, one at a time, to see if one of them (or a driver) is causing problems.

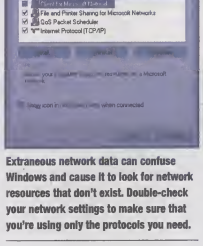
To disable devices, right-click the My Computer icon, click Properties, and choose the Device Manager tab (in WinXP, right-click My Computer, click Properties, choose the Hardware tab, and click the Device Manager button). In the Device Manager, locate the devices you can disable without interfering with your computer's general operation; these devices include your sound card, network adapter, scanner, Zip drive, and printer. Double-click the device listing within the Device Manager, choose the General tab, and select the Disable In This Hardware Profile checkbox (in Win98 SE and WinMe) or select Do Not Use This Device (Disable) from the Device Usage drop-down menu (in WinXP). Click OK to close all the open dialog boxes, and then restart your computer.

If you still encounter lockups after disabling a particular device, restart your computer, enter the Device Manager, and re-enable the device. Then choose another nonessential device and follow the-same steps to disable it. Continue this process until you find (or don't find) which device is causing trouble. Sure, it's a painstaking process, but if it solves your lockup woes, it's worth it. If you do find a problem device, you'll need to check its connection, update its driver, and/or replace it altogether if it's no longer working correctly. If you can't coerce a device to cooperate with APM, check the device's manual or the manufacturer's Web site for support tips.

As a last-ditch effort to solve lockup problems APM causes, you might be able to update your BIOS. However, this a delicate process that you shouldn't take lightly. First, you'll need to check with your computer or motherboard manufacturer to see if a BIOS upgrade is available. If one is, see PC Mechanic's Updating/Flashing BIOS page (http://www.pcmech.com/show/bios/81) for detailed instructions about this process, and bookmark BadFlash.Com (http://www.badflash.com) on another computer just in case you run into trouble after you've updated your BIOS.


NVIDIA GeForce3 Ti 500 Properties
NVIDIA GeForce3 Ti 500
Driver Provider: NVIDIA
Driver Date: 5/1/2002
Driver Version: 2.5.4.2
Digital Signer: Microsoft Windows Hardware Compatibility Publ
To view details about the driver files.
To update the driver for this device.
If the device fails after updating the driver, roll back to the previously installed driver.
To uninstall the driver (Advanced).

Old drivers are often incompatible with new software, which can lead to frozen Desktops and crashes. Use the Device Manager to check the properties of your devices and download new drivers from manufacturers' Web sites.


Local Area Connection 3 Properties
Connect using:
3Com 3C920B-TPO Ethernet Adapter (Generic) #2
This connection uses the following items:
File and Printer Sharing for Microsoft Networks
QoS Packet Scheduler
Internet Protocol (TCP/IP)
when connected

Extraneous network data can confuse Windows and cause it to look for network resources that don't exist. Double-check your network settings to make sure that you're using only the protocols you need.

■ **Investigate Your Apps.** If your lockups occur while using a particular program and you're sure your hardware isn't to blame, try to recreate the problem several times. Does it happen when you perform a certain action in the program? Does it happen when you start or exit the program? Does it happen when the program is open but you're not using it?

If the problem tends to occur each time you perform the same action in a program, the program probably has a bug. Visit the software developer's Web site and see if it released a patch (or patches) for the program. Developers typically release patches for popular programs on a regular basis, and it's a good idea to download and install them to keep your programs error-free. If a patch isn't available, check the site's support section for a possible workaround. If you have no luck finding any information on the developer's site, search Google Groups (http://groups.google.com) to see if other users have encountered the same problem. If you have a subscription to *Smart Computing* magazine, you can visit the Q&A Board on its Web site (http://www.smartcomputing.com) to find out what other users are saying about the program there.

If the lockups occur when you open or close a program, or when the program is idling in the background, a conflict might be occurring with another program or utility. Take note of all your open programs, as well as any background programs, including all the System Tray utilities. One by one, close each program and utility and continue working until you no longer experience system lockups. While doing so, if you find that closing a particular program lets you work without experiencing system freezes, go online to find a patch or workaround for that program. Just like hardware, software also can experience conflicts when several are trying to use (or misuse) the same system resources. If this problem affects enough users, responsible manufacturers will patch the application or offer an equally effective fix.

■ **Check Your Hardware Connections.** Like many other computer problems, you can often trace lockups to faulty hardware connections. If you don't fully insert devices or properly connect cables, your PC will likely respond with occasional error messages or decide not to respond at all.

First, unplug your computer and ground yourself before opening the case cover. We recommend that you ground yourself by wearing an antistatic wristband or touching a metal object outside your system's case to discharge any static electricity buildup. When you check the connections, check everything that's removable, including add-on cards (such as video, sound, etc.), cables, and memory modules. Even if your add-on cards appear firmly in place, remove and reseat them in the appropriate motherboard slots. Do the same with

your memory modules and any cables connected to devices and your motherboard.

Also, make sure the jumpers on your hard drive(s) and optical drive(s) are in the proper positions. If you position the jumpers on your disc drive to signify a master device (rather than a slave device), lockups are likely to occur, if the drive works at all. If you're not sure what position the jumpers should be in on your devices, check your computer's users manual (or check your hard drive or optical drive manual if your upgraded a drive on your own).

After you check all of your internal connections, inspect all external connections. Remove and replace all of your cables to make sure they're firmly connected. Then, if you're still experiencing lockups, test the integrity of your external cables by gently shaking them while your computer is running. Does a lockup occur when you do this? If so, the cable probably has a faulty wiring connection. If a faulty cable is a permanent part of a device, such as with your mouse or keyboard, you might need to replace the entire device.

Hardware devices can also conflict with each other, especially when they try to simultaneously use the same system resource. When this occurs, one or more devices might refuse to work and cause a system lockup. For more information, see "Conflicts Among IRQs & Devices" on page 30.

So, if you can't live without your overclocked devices, at least consider upgrading the heat sink and fan on your processor and/or video card to handle the extra heat. Although users can overclock some retail processors and video cards without problems, many components will exhibit problems if you leave the original cooling solution intact.

If you haven't overclocked any of your devices, it's still possible for you to have a heat problem inside your case. While your computer is on, check the power supply fan on the back panel of your case. Is it running? If it isn't, the heat your PC's components generates probably isn't escaping the case. You'll need to replace the fan or the entire power supply unit.

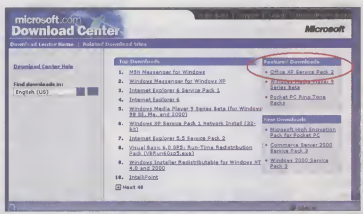
If the power supply fan is functional, open your case while the computer is still running, being careful not to touch anything inside the case. Check any fans attached to the case or any components such as the processor or video card. If any of these aren't running, you've likely found your problem.

Shut down your computer, unplug it, and ground yourself. Check the disabled fan to see if dust and grime are blocking the fan blades, and if they are, clean the fan and see if it works now. If it doesn't, the fan's motor probably died, so you will need to replace the fan.

But even if all fans are operational, you still could have a heat problem. Poke around to see if any cables are obstructing airflow in your computer case. Some cases only use the power supply fan to remove hot air, but other cases have an additional rear fan, as well as a fan placed in the front of the case to draw air in. Thick cables (particularly ribbon cables) tend to flop around and sit in the path of a fan's airflow. If you've tried to position cables away from fans but haven't had any luck, use cable ties to bundle cables together and out of the way.

If fans and airflow don't seem to be the cause of your case's heat trouble, try touching some of the components in the case—but only for a second because some devices can become hot enough to burn your skin. If any areas on your motherboard seem to be extremely hot, you might have a malfunctioning motherboard. The same is true of your hard drive, although normally functioning hard drives can generate excessive heat in a poorly cooled case or a case that's too small. Check the system's memory modules, as well. If they're too hot to touch, you might have problems with either the memory or the motherboard.

Consider using a motherboard monitoring tool to help pinpoint your heating problems. Download Motherboard Monitor (free; http://mbm.livewiredev.com) and install it to keep track your processor temperature, fan speeds, and more.


microsoft.com
Download Center
Microsoft
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Find downloads in:
English (US)
Top Downloads
1. MSN Messenger for Windows
2. Windows Messenger for Windows XP
3. Internet Explorer 6 Service Pack 1
4. Internet Explorer 6
5. Windows Media Player 9 Series Beta (for Windows 98 SE, Me, and 2000)
6. Windows XP Service Pack 1 Network Install (32-bit)
7. Internet Explorer 5.5 Service Pack 2
8. Visual Basic 6.0 MSDN Run-Time Redistribution Pack (VB6runtime.exe)
9. Windows Installer Redistributable for Windows NT 4.0 and 2000
10. IntelliPoint
Next 10
Keyboard Downloads
Office XP Service Pack 2
Windows Media Player 9 Series Beta
Pocket PC Time Zone Fixes
New Downloads
Microsoft High Expansion Pack for Pocket PC
Commerce Server 2000 Service Pack 3
Windows 2000 Service Pack 3

Even if you keep your computer in tip-top shape, it's difficult to avoid buggy software. If you're encountering lockups while using a particular program, check the software developer's site to find a patch (or patches) you can download to resolve the issue.

■ **Don't Forget Your Memory.** As certain computer components (such as processors) have increased their speeds over the years, they've also grown more reliable, thanks to more efficient circuitry. Increased speeds have also blessed system memory, but reliability problems are still evident. In fact, memory problems you encountered years ago can still crop up now with newer modules; and these problems occur, you're likely to experience severe lockups and other crashes.

If you suspect bad memory could be freezing your PC, shut off and unplug your computer, ground yourself, and open the case. Make sure the memory modules are seated firmly in the motherboard; if you can't determine this by looking at the modules, remove all of them and use a can of compressed air to disperse any dust from the modules and the motherboard slots. Then, replace the modules. When you remove or insert a module, always use two hands spaced evenly apart to apply pressure evenly across the module. These components are fragile, so take your time to avoid cracking them.

If removing and replacing the memory modules doesn't help, switch their slot positions. If

■ **Too Hot To Handle.** Overheated PC components can cause a variety of problems, including lockups. Although manufacturers build today's computer hardware devices to withstand higher-than-normal temperatures, these devices can only take so much.

If you've **overclocked** (changed hardware settings so a component runs at a speed faster than what the manufacturer intended) your processor or video card, and now your system experiences lockups, you should immediately return the devices to their original speeds. Overclocking your devices generates excessive heat that some components simply can't handle. It's important to keep in mind that if you overclocked your processor by increasing the speed of your frontside bus, you're also running other system components beyond their retail specifications.

you have only one module, insert it into a different slot. Try several combinations, restarting your computer after each new combination. If you experience only occasional lockups, this process could take days or weeks to work because you'll need to wait until your PC freezes to try a new combination.

If this process doesn't work and you have more than one module, remove one module and restart your computer. If the computer still freezes, keep removing and replacing modules until you find the suspect module. Again, this can be a lengthy process, but if you have a bad module, it's worth your investigative efforts to solve the problem.

If this physical troubleshooting process yields no results, you should employ the help of software troubleshooters. Several products are available to test the integrity of your memory, which can help you pinpoint a faulty module. #1-TuffTEST from #1-PC Diagnostics Company ($9.95; http://www.tufftest.com) is a PC diagnostic program that boots your computer and tests your memory outside of the OS (operating system). With this program, you can test all sizes, speeds, and types of memory, including SDRAM (synchronous dynamic RAM), DDR SDRAM (double-data-rate SDRAM), and RDRAM (Rambus dynamic RAM).

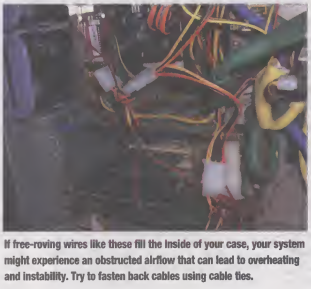
You can also try CST's DocMemory (free for a limited time; http://www.simmtester.com), another OS-independent program that tests SDRAM, DDR, and RDRAM modules, among others. This utility walks your memory through a rigid set of tests that can detect possible memory failures.

Another problem you might encounter is *lack* of memory, which could lead to long delays or even lockups in severe situations. WinXP, in particular, has hefty memory requirements, and if your computer has less than 128MB of RAM, you're asking for trouble.

The most effective way to fix a memory shortage is to buy more. Memory prices dropped dramatically in recent years, and you'll likely find that doubling or tripling your current amount of memory is an affordable option. Furthermore, your motherboard might support faster memory than what you are currently using, so check the users manual for your computer or motherboard before buying memory.

Some users also try to tweak Windows' virtual memory settings in an attempt to simulate more memory than what they really have. Although this process can be successful in certain situations, we don't recommend changing virtual memory settings unless you know what you're doing. Improper settings can result in worse stability that what you already have.

By removing and reseating your add-on adapter cards, system memory modules, and cables, you can avoid faulty connections that often result in system lockups.



If free-roving wires like these fill the inside of your case, your system might experience an obstructed airflow that can lead to overheating and instability. Try to fasten back cables using cable ties.

■ **Harness Your Network.** Although Windows networking has become easier to manage in Windows OSes released after Windows 95, difficult-to-track problems can still periodically crop up. And when problems emerge and you're not even using the network, you might have a tough time locating the trouble source.

If you have a home network installed, make sure that all computers connected to the network are communicating with each other. If they're not, Windows might spend time looking for a host or client and subsequently seize your working environment in the meantime. Check the network settings on the computer that's experiencing lockups. Open the Control Panel, double-click Network (Network Connections in the Network And Internet Connections category in WinXP), and try to disable protocols one at a time to see if you can still enjoy network communication but avoid lockups. Because Windows will occasionally install more protocols than is necessary to achieve efficient network communication, this elimination process can help disable extraneous network settings.

If you're not connected to a network but have a NIC (network interface card) installed in your system, uninstall the card if you don't need it for an Internet connection such as cable or DSL (Digital Subscriber Line). An installed card with no network can cause Windows to freeze while searching for a nonexistent network.

■ **Start From Scratch.** Not only are system lockups extremely frustrating, they're also dangerous. You could lose valuable work if your applications can't save any open files before errors freeze your computer. So, if your troubleshooting efforts still can't prevent an endless array of system lockups, perhaps it's time to consider starting over. Back up all your important files, reformat your hard drive, and then reinstall Windows and all your applications. Now, this time around, remember: If you don't perform regular system maintenance, your Windows environment can become so corrupt that most troubleshooting strategies won't fix it. (For more information, see "Smooth Operation" on page 5.)

On the other hand, if you *do* take good care of your computer, don't fret when lockups occur because they happen to the best of us. The cause might take a significant amount of digging to locate, but it's usually an easy fix once you find it. LS

by Christian Perry

A Slow Crawl

Rev Up Your Computer & Move It Into A Faster Lane

Remember the good old days, when your computer took only a few seconds to open programs? When browsing through the folders on your hard drive was a breeze, not an ordeal?

The irony would be delicious if you weren't the victim. New computers boast breakneck speeds, while your computer continues to get *slower*. Once-simple tasks now consume inordinate amounts of your precious time, yet no error messages or blue screens display to help expose the problem.

System slowdown problems are common on many computers, especially those that aren't regularly maintained. Even so, slowdowns can still occur on well-maintained systems, and when they do, they can be difficult to track.

Check Your Hardware First. If your system isn't quite as speedy as it used to be, one or more of your hardware connections could be causing trouble. Even if you haven't recently installed hardware, connections can become loose over time, particularly if you tend to move your computer case around. Loose connections can cause your computer to spend excessive amounts of time looking for components, so if you've encountered problems, make sure all of your hardware is firmly attached inside and outside of your computer.

To check your hardware, unplug your computer and all of its components and ground yourself before opening the case cover. We recommend that you ground yourself by wearing an antistatic wristband or touching a metal object outside your system's case to discharge any static electricity.

Carefully inspect all the connections inside your case. This includes memory modules and add-on cards such as video, sound, and network cards. You also should confirm that all cables from the motherboard securely attach to your hard drive(s), floppy diskette drive, and optical drives (CD-ROM, DVD-ROM, CD-RW [CD-rewriteable], etc.).

After you finish checking the inside of your computer case and replace the cover, check all of your external connections. Your keyboard, mouse, monitor, USB (Universal Serial Bus) devices, and any gaming devices should securely fasten to their proper ports.

Look Hard At The Hard Drive. The most likely suspect when it comes to system slowdowns is your hard drive. If you don't perform regular maintenance on your hard drive, you'll likely encounter severe slowdowns eventually as your hard drive works overtime to access data it didn't properly store. A tell-tale sign of hard drive problems is thrashing, a term that describes excessive hard drive activity when you ask your computer to perform simple duties, such as opening windows or small files.

Thankfully, hard drive maintenance tasks are easy to perform, and with regular practice, your system slowdowns will likely become a thing of the past. First, start by scanning your hard drive for errors using Windows' built-in ScanDisk utility. In Windows 98 Second Edition and Windows Me, click Start, Programs, Accessories, System Tools, and ScanDisk. Select the drive you want to scan, click the radio button next to Standard under Type Of Test, and click Start. In Windows XP, double-click the My Computer icon, right-click the hard drive icon, select Properties, choose the Tools tab, click the Check Now button in the Error-Checking area, and then click Start.

After you scan your drive, it's time to use the Disk Defragmenter. To find it, open the Start menu and click Programs (All Programs in WinXP), Accessories, and System Tools. If you use Win98 SE or WinMe, click the Settings button and select the checkboxes next to Rearrange Program Files So My Programs Start Faster and Check The Drive For Errors. Click OK. Then, from the Select Drive dialog box, choose the drive you want to defragment from the drop-down menu and click OK. If you use WinXP, all you have to do is select the hard drive and click the Defragment button.

Another utility that can restore the health of your hard drive is Disk Cleanup. This tool lets you delete unnecessary files that can slow your hard drive's performance to a crawl, especially if your drive is running out of space. To launch Disk Cleanup, click Start, Programs (All Programs in WinXP), Accessories, System Tools, and Disk Cleanup. In its window, you'll see a list of files you can delete, such as temporary files, temporary Internet files, and downloaded program files. Select the checkboxes next to the items you want to delete and click OK.

Scan For Viruses. Viruses are responsible for a large array of erratic computer behavior, but more subtle infections can cause a general system slowdown. Although you already should be scanning your computer for viruses on a regular basis, if you notice that your system is running slower than it used to, drop what you're doing and run a virus scan again. It's best to do this as soon as possible because if your system does have a virus, you don't want it to cause more damage than it already has.

Assuming you have antivirus software installed, follow the manufacturer's directions for running a virus scan. And if you haven't updated your virus definitions in the last month or more, do so now before running this

scan (again, follow the directions included with the software).

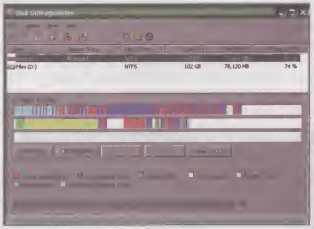
If you don't have antivirus software installed, you're taking a big risk with your system's security and performance. For a quick, effective fix (that's good enough to be a long-term fix), download Grisoft's AVG 6.0 Free Edition (http://www.grisoft.com; click the Free Downloads link). This free antivirus software delivers thorough, nonintrusive virus protection, along with regular Internet updates.

Treat Your Registry Right. Your Windows Registry is full of information that keeps track of system settings, software configurations, and much more. Windows constantly modifies the Registry behind the scenes, changing it most of the time as you alter your Windows environment, fine-tune settings, and install/uninstall software (not all changes require Registry modifications, though).

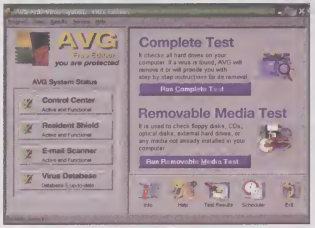
The Registry expects these changes to happen according to standard procedure. For example, when you install software, some of its information usually enters the Registry; alternately, when you uninstall the software using the Add/Remove Programs utility (found in the Control Panel), the utility removes this same collection of information. But if you remove the software by merely deleting the program's folder, all of its Registry information remains behind, which essentially bloats the Registry with useless data that can bog down your system's performance. And even when you use the uninstall utilities bundled with some programs, you can still end up with extraneous Registry data because some of these uninstall utilities do a poor job of removing Registry information.

Therefore, it's a good idea to always use the Add/Remove Programs utility to uninstall programs. To do so, click Start, Control Panel (click Settings to find the Control Panel in Win98 SE and WinMe), and Add/Remove Programs. Select the program you want to uninstall and click Add/Remove (in Win98 SE and WinMe) or Change/Remove (in WinXP).

If the program you want to uninstall does not appear in the utility's list of programs, you can remove it in one of three ways. The first option is to use the program's own uninstall utility, if one is included. Your second option is to simply delete the program's folder on your hard drive and hope that the program didn't place any entries in the Registry when you installed it. The last option is to delete the program folder, enter the Registry, and manually search for and delete any entries for the program.



The data stored on your hard drive becomes fragmented over time, leading to poor system performance. Use Disk Defragmenter on a regular basis to avoid this problem.



Viruses can slow your system's performance to a standstill, so if you notice suspicious behavior, scan your system using antivirus software, such as Grisoft's AVG.

If you try to manually delete Registry entries, tread carefully because making changes to your Registry can severely damage your Windows environment if you're not sure what you're doing. Use this option only as a last resort, as you're probably better off leaving the extraneous data in the Registry than taking a chance by deleting it.

Even if you try your best to keep your Registry clean, it will inevitably expand with data you don't need over time. Although you can attempt the painstaking, dangerous process of manually weeding out unnecessary entries, it might just be smarter to download a utility that will do the work for you.

Microsoft used to offer a standalone program called RegClean that did a decent job of cleaning the Registry, but recently discontinued it. However, if you already have a copy of RegClean (if you don't, you can find copies to download from the Web), you can still use it with Win98 SE and WinMe, but *do not* use it with WinXP because it can cause serious Registry errors.

Instead, download Jouni Vuorio's free RegCleaner (http://www.vtoy.fi/jv16/shtml/regcleaner.shtml), which removes old and obsolete entries in your Registry (and includes other useful features). RegCleaner works with Win98 SE, WinMe, and WinXP systems.

Beat The Heat. Many new processors will decrease their clock speed if they begin to overheat, and older processors can cause general system instability when overheated. To check for overheating, open your case while your computer is still running, and being careful not to touch anything inside the case, look closely at the fan and heat sink covering your processor. Make sure the fan is spinning; if it isn't, you probably found the cause of your system's slowdown problem. On the other hand, if the fan is spinning, but you see excessive amounts of dust and grime, these culprits might be what's slowing down the fan's speed.

If you find too much dust, turn off your system, grab a can of compressed air, and blow the dust off of the fan blades and the fan's internal parts. If grime is covering the blades, ground yourself and use cotton swabs to clean what you can, although a more thorough cleaning is possible if you actually remove the entire processor unit (including the fan and heat sink). Consult your motherboard manual for instructions about how to remove your processor unit.

If the fan isn't spinning and removing the dust and grime doesn't help resolve this, you'll need to replace the fan. You can either replace the fan yourself or have it replaced under your computer's warranty (if you have one). If you choose to replace it yourself,

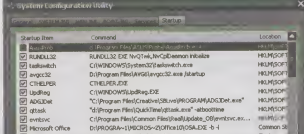
you'll find it's not an overly difficult job, and it's a good hardware experience to have under your belt. However, replacing the fan yourself may void your computer's warranty, if one is still in effect, so be sure to check into this possibility first.

Some older processors use only a heat sink for cooling, and it's more difficult to pinpoint cooling problems with these units because heat sinks typically don't break. In these situations, processor overheating is often due to overheated cases. Make sure that your computer case has adequate airflow, with at least one working fan in the front of the case drawing air in and one in the rear pushing air out. For many computers, the power supply's fan is adequate as the rear case fan.

You can keep an eye on your processor's temperature by using a monitoring utility. Motherboard Monitor (http://mbm.livewiredev.com) is a free utility that monitors your processor temperature, fan speeds, and more. It works with most motherboards, but if it's not compatible with yours (click the About MBM link on the home page), your motherboard manufacturer may provide its own monitoring utility. For example, new ASUS motherboards include a tool called PC Probe, which includes functions similar to those found in Motherboard Monitor.

applications, and if you see one you know you don't use or need, make note of it.

Next, click Start, Run, type **msconfig** in the field, and press ENTER. When the System Configuration Utility opens, choose the Startup tab. Here, you'll see a list of applications currently set to automatically open upon startup. Look for those you recognize as utilities linked to System Tray icons that you don't need to run in the background. You might need to inspect the Command and Location columns for more information about the applications because some of the names tend to be obscure. For example, the QuickTime utility can appear in the list as "qttask," but if you look at its entry in the Command column, you'll notice that its path leads to the QuickTime folder on your hard drive.



Letting too many applications run in the background can drain system resources. Use the System Configuration Utility to disable unnecessary programs.

■ **Stop Runaway Startups.** Software can be sneaky. Some programs behave and only run when you want them to run. Others open themselves automatically whenever you start Windows and remain open in the background, consuming system resources.

Some of these background programs are necessary, such as antivirus utilities. But others drain your resources while providing little or nothing in return. Inexperienced PC users are often guilty of cramming their computers with dozens of useless utilities, many of which run in the background. Have you ever seen a System Tray jammed with 10 or more icons? If so, you've witnessed wasted system resources.

Fortunately, you can prevent most useless background applications from starting automatically with Windows by using the System Configuration Utility. Before you use it, take an inventory of what's sitting in your System Tray. Double-click the icons to open the

To disable a startup item, simply remove the check mark beside it. If you're not sure what an item represents and can't determine what it is from inspecting the Command and Location columns, run a search on your computer for the item. You also can enter the item into the Google Groups search engine (http://groups.google.com) to see what others are saying about it. Chances are good that someone else has wondered what a particular item is and asked the Usenet community for guidance.

When you finish disabling these startup items, click OK in the System Configuration Utility and restart your computer. Depending on how many items you disabled, you should notice a faster boot time and quicker overall system performance.

■ **Pull Out Your Wallet.** If you haven't upgraded in years, your system slowdown problems could simply be a sign of your computer's old age. Developers create applications and games to take advantage of current computer technology, but if you're trying to run new software on old hardware, you'll soon be frustrated by your system's lack of speed.

Does this mean you need to buy an entirely new computer? Not necessarily. A processor or memory upgrade can boost the speed of an outdated system significantly, but if you only upgrade one of these components even though both of them need a boost, you won't see much of a speed improvement—if you see one at all.

For example, if your computer has a 350MHz processor with 64MB of RAM, upgrading your system's RAM to 256MB won't be a significant help because the data will just become bottlenecked at your outdated processor, particularly while using high-powered 3D applications and games.

Therefore, if you're upgrading to take care of a speed issue, make sure you tackle both the processor and RAM upgrades. And if you work heavily with image-intensive programs or play 3D games, you also might need to replace your video card because a new processor and more RAM can only help so much in this area. When you begin shopping, visit Price Watch (http://www.pricewatch.com) to search for the least expensive online hardware prices.

■ **Be Proactive.** You can avoid several slowdown problems by implementing regular maintenance tasks into your system schedule. In addition, each time you install a new program, see if it added an icon to your System Tray; and if it has, look at what utility it loads in the background and its specific purpose to determine if you really need it. And when you do uninstall programs, do it the correct way; although you might save yourself a minute or two by merely deleting the program's folder, you'll end up spending more time in the future dealing with a bogged-down system and Registry.

Outdated hardware and other hardware problems can be difficult to avoid, but prevention is typically the best way to combat glitches that can slow down your system. For more information about keeping your system in tip-top shape, see "Smooth Operation" on page 5. LS

by Christian Perry

The BIOS' Role During Startup

How The BIOS & Your PC Work Together To Control System Settings

When a force of U.S. Rangers and other military operatives found themselves pinned down by withering gunfire in Mogadishu, Somalia, in 1993, they requested immediate assistance. The officers in charge of the operation responded to the soldiers' pleas for help but knew that it could take several hours to mobilize an adequate rescue squad. The process of preparing hundreds of troops and vehicles for a complex mission requires time.

Starting a computer is much different from mobilizing a military unit, but the two activities share one common element: neither can start moving in an instant. Organizing a collection of resting parts into a functioning machine is a complicated process that demands strict oversight. And although the military has a staff of highly trained officers to manage the rollout of armed troops, your computer relies on its BIOS (Basic Input/Output System; pronounced "bye-ose") to direct the launch of system hardware and software.

All About BIOS. BIOS is the program that guides a PC through its startup routine. The typical BIOS consists of a set of simple instructions that are written on a **flash ROM** (**read-only memory**; an area of solid-state data storage) chip during production (post-production modifications are possible with BIOS updating software). The chip resides on the motherboard, near the processor. From this vantage point, the BIOS is able to facilitate the initial communication between the system hardware and software that makes the hardware functional.

You don't need to know the particular details of what the BIOS does in its few seconds of mission-critical functionality, but you should have a general idea of how it works. Here's what happens: As soon as you press the computer's power button, the processor receives a jolt of electricity and immediately accesses the BIOS code. The code contains instructions for identifying the processor, launching the **POST** (**power on self test**; the process by which the BIOS checks the system components to make sure they're working properly), inventorying the system components, and updating the date and time. After the BIOS determines that the system hardware is fully functional, it loads the OS (operating system) and retreats into the background.

The background is where the BIOS prefers to be. That's also where computer manufacturers want to keep it. The fact is that even a minor change to the BIOS configuration could mean the difference between a system that offers peak performance and a system that does not perform at all. To minimize the odds of dealing with accidental BIOS configuration errors, many of the largest computer manufacturers have taken steps to hide BIOSes on their computer systems. In most cases, that's a good thing. Average computer users will rarely (if ever) have a reason to modify a BIOS configuration. They can get their PCs to do everything they want them to do without messing around with fragile system settings.

Nevertheless, you may find it helpful to have at least a rudimentary familiarity with the software that controls your computer's startup routine. Specifically, you should know the type of BIOS your computer has, how to access that BIOS, and what the most common BIOS settings are. Such knowledge can prove very useful for getting out of more than one PC jam.

Type of BIOS. The first thing you should know about the BIOS is its name and version (also referred to as the rev or revision) number. You can get this information by looking in the users manual or product documentation that came with your PC or calling the computer or motherboard manufacturer directly and asking which BIOS is installed on your PC. If you have an older computer, you may be able to get the BIOS name and version number by watching the screen during the startup sequence; the information will flash on-screen shortly after you press the computer's power button.

Most of the PC BIOSes produced today come from one of two developers: Phoenix Technologies (http://www.phoenix.com) and American Megatrends Inc. (also referred to as AMI; http://www.ami.com). These companies license their BIOSes to the various computer and motherboard manufacturers, who then install them on the ROM chips during the manufacturing process. In the event that you ever need assistance with your BIOS, you should contact the computer or motherboard manufacturer first. Don't call the BIOS manufacturer for technical assistance unless the computer or motherboard manufacturer tells you to do so.

How to access it. The BIOS setup utility is the configuration program that helps you change the BIOS settings. The only way to access the BIOS setup utility is by pressing (or repeatedly pressing) the appropriate key

command as soon as you **boot** (start) the computer. If you're lucky, a message that appears on-screen during the boot sequence will tell you what the key command is. Otherwise, you'll have to read through the users manual or contact the computer manufacturer to determine which key or keys provide access to the BIOS setup utility. The usual suspects are the F1, F8, ESC, and DELETE keys, although the computer manufacturer can program any key or combination of keys (such as CTRL-ALT-ESC) to serve as the key command.

Whatever the key command is, you need to be quick about pressing it. We suggest that you begin pressing the appropriate key (or keys) repeatedly as soon as you boot the computer. That's the best way to snag the BIOS setup utility before the BIOS completes its task and launches the OS, at which point it's too late to access the utility. If you miss your chance, you'll just have to reboot the computer and try again.

The BIOS (Basic Input/Output System) manages the system IDE (Integrated Drive Electronics) configuration by defining whether a drive connects to the primary or secondary IDE port and whether it is the master or slave drive on the port. Most systems designate the Windows drive (the hard drive on which Windows is installed) and the optical disc drive as master devices and designate second hard drives and backup drives as slave drives. The floppy diskette drive connects to its own IDE port.

■ **The BIOS Setup Utility.** After you gain access to the BIOS setup utility, take a few moments to look around. You will see settings for various system components, of course. You also will see some of the PC's vital statistics, such as the name of the BIOS, a count of total system memory, the processor type and speed, and the date and time.

Most importantly, you will see a list of navigation commands indicating how to select items, change values, view more settings, set default values, and exit with or without saving changes. Take special note of these commands, which will stay on-screen the entire time you remain in the setup utility. As long as you use them properly, you can safely view and modify all of the BIOS settings. In addition, you can protect yourself against accidental changes by executing the command for exiting without saving changes (usually the ESC key). Only when you intentionally change an existing setting should you invoke the command that lets you save changes upon exiting.

The names and values of the settings that are available to you will vary from one BIOS to the next, but the general areas of configuration will remain the same. We listed each of these areas in the following paragraphs.

Password or security. The password or security setting lets you set a password that is designed to protect your system from unauthorized users who try to access it. Unlike the Windows password, which Microsoft designed to prevent access to a Windows OS, the BIOS password is designed to prevent unauthorized access to an entire computer system. You should set this password if security is a primary concern for you. Please note that while establishing the password, you may need to type the password twice for verification purposes.

Battery (notebook computers only) or power management. These settings let you configure the power-savings mode for your PC, typically providing more advanced power-saving features than the OS' built-in power management utility. They may let you adjust the brightness of the LCD (liquid-crystal display), for instance, or configure the method of cooling the processor. Use the battery or power management settings to augment your computer's other power management capabilities.

I/O port. An **I/O (input/output)** port is any port on your computer that lets data come in or go out. When the BIOS setup utility refers to I/O ports, however, it generally is referring only to serial, parallel, and USB (Universal Serial Bus) ports.

Among the several I/O port settings available, two stand out from the rest. The first is the parallel port mode setting. This setting specifies whether the parallel port is operating in ECP (Extended Capabilities Port), EPP (Enhanced Parallel Port), or standard bidirectional mode. As a rule, you should stick with the default parallel port mode setting unless you replace the port or buy a peripheral (such as a printer or scanner) that requires a specific mode setting. In either case, set the mode according to the instructions provided in the users manual.

The second setting you should pay attention to is the **legacy USB** (devices that must function even if USB drivers are not active in PCs) setting. This setting, which is either enabled or disabled, specifies whether legacy USB devices will function if a USB driver fails to load properly. The only reason you should modify the legacy USB setting is if it is disabled and you experience trouble using your legacy USB devices, such as a USB keyboard or mouse.

You should not interfere with the other I/O port settings, including:

- the name, such as COM1 or LPT2
- I/O address, such as 3F8H or 3BCH
- interrupt level (**interrupt** is a signal which tells the processor to stop what it's doing and give its attention to something else; these signals transmit along IRQs [**interrupt request lines**]), such as IRQ3 ,
- DMA mode (DMA [**direct memory access**] is the data transfer from a drive to memory without passing through the processor; in most computers, the data travels along eight channels, which are identified by the acronym CH), such as CH3

Actually, you may not even have the chance to interfere: Ever since the development of plug-and-play technology shifted the control of port setting assignments from the end user to the OS, BIOS developers have designed their products to prevent user changes to I/O port settings.

In the unlikely event that you experience a system problem due to I/O port conflicts, we advise using the Device Manager tool in Windows rather than the BIOS setup utility to

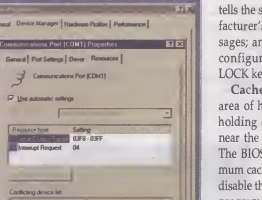
make adjustments to these settings. You can access the Device Manager in Windows 98 SE and Windows Me by right-clicking the My Computer icon on the Desktop, selecting Properties from the pop-up menu, and choosing the Device Manager tab in the resulting dialog box. In Windows XP, you can access the Device Manager by opening the Start menu, right-clicking My Computer, selecting Properties from the pop-up menu, choosing the Hardware tab, and clicking the Device Manager button.

Either way, you can make changes by highlighting the port in question (probably listed below Ports or Universal Serial Bus Controllers), double-clicking it, and choosing the Resources tab in the resulting dialog box. If the Device Manager prevents you from changing these settings, contact the computer manufacturer for assistance.

IDE configuration. The IDE (Integrated Drive Electronics) standard represents the most common interface technology used in connecting drives to a motherboard. In most systems, the hard drive(s), diskette drive, and disc drive(s) all connect to the motherboard through IDE ports. The IDE configuration settings in the BIOS let you define the specifics of those connections. For example, you can specify whether the hard drive should operate in EIDE (Enhanced IDE) or standard IDE mode.

You also can stipulate the arrangement of drives on the IDE ports. Why would you need to do that? Consider that a typical motherboard has a pair of IDE ports (one referred to as the primary port and the other referred to as the secondary port) and each of these ports supports a pair of devices, one referred to as the master device (the primary device attached to a port) and the other referred to as the slave device (the secondary device attached to a port). In order for the system to function properly, the BIOS must keep track of which drive occupies the primary master position and which occupies the secondary slave position and which drives reside in between. The drive installation software should handle this configuration task for you, but if it doesn't or if you experience trouble with the drives after performing an upgrade, you will have to modify the configuration within the BIOS.

Boot priority and boot options. Arguably one of the most important settings in the BIOS setup utility is the boot priority setting, which tells the computer where it can find the information it needs to boot the computer.



Thanks to Windows configuration tools such as the Device Manager, shown above, it's unlikely you will ever have to access the BIOS setup utility and make changes to the settings there.

The standard boot priority setting tells the BIOS to look to the diskette drive (also called the floppy diskette drive or FDD) first before proceeding to the disc drive (either a CD-ROM, DVD-ROM, or some other type of optical disc drive) and then to the hard drive (also called a hard disk drive or HDD) for startup instructions. A growing number of BIOSes, however, are programmed to look first to the optical disc drive before checking the diskette drive or booting from the hard drive. In any case, changes to this setting can have deep repercussions on how you start your PC. We suggest using the default setting unless you have a particular reason for doing otherwise (if you remove the diskette drive from your computer, for instance, you need to remove FDD as an option on the boot priority list).

Your BIOS may offer a slew of boot options in addition to the boot priority setting. Some common boot options include the Quick Boot, which tells the BIOS to skip certain startup tests in order to launch the OS a hair faster than it might otherwise; the Quiet Boot, which tells the system to display the computer manufacturer's logo instead of BIOS-related messages; and the Boot-Up NUM LOCK, which configures the BIOS to activate the NUM LOCK key upon starting the computer.

Cache. In a computer, a **cache** is a small area of high-speed memory for temporarily holding data. It typically resides on or very near the processor but is not a part of RAM. The BIOS is set by default to allow for optimum cache performance, but you may need to disable the cache settings if you are using older programs or hardware components that conflict with the cache. As a rule, you should not adjust the cache settings unless a support technician tells you to do so.

Language. Some BIOS versions let you specify the language in which information appears in the BIOS setup utility. Use the language setting to choose English, French, Spanish, German, or another supported language for viewing your BIOS configuration.

Others. In addition to the settings described above, the BIOS setup utility also may let you turn the system beep codes on and off; set the volume of system alarms, such as the low battery alarm; and disable the diskette drive. These optional settings will vary depending on the type and version of BIOS you have. Configure these options at your own discretion.

■ **Beyond The BIOS.** As significant as the BIOS is to your PC's startup procedure, it's importance as a system configuration tool has diminished in recent years. Windows is smarter than ever and able to handle many of the settings that users once had to manage by themselves. Hardware and software setup utilities also have taken over a number of the BIOS configuration tasks that end users use to handle. For this reason, we recommend that you leave the BIOS settings alone unless you have a particular reason for changing them. LS

by Jeff Dodd

Back Up Your BIOS

Considering the importance of the BIOS (Basic Input/Output System) to your PC, you may be surprised to learn that the best way of backing it up is to write it down. Yep, you read that right. A BIOS backup is simply a written record of the BIOS type and all of its current settings. You should mark this "backup" with the current date so you know when you wrote it and store it in a safe location with the rest of your product documentation. Update the "backup" whenever you make changes to the BIOS. ■

When Input Goes Kaput

Troubleshoot Mice, Keyboards & Other Input Devices

Humans have all sorts of data receptors: eyes that see images and lights, ears that hear sounds, a nose that sniffs scents, and skin that feels the texture of objects. When PC manufacturers assemble their products, they design computers to use data receptors for the same types of reasons humans rely on such receptors. For example, the typical computer has a keyboard for accepting text input, a mouse for making selections, a scanner for importing copies of hard-copy graphics, and a microphone for picking up noises and vocal commands.

Finding input mechanisms in humans and computers is not an accident; a constant flow of incoming information is crucial to the health and productivity of both. Without data, minds become numb and processors sit idle. Fortunately, the worlds of nature and technology provide enough stimuli to keep our input mechanisms constantly busy. Indeed, the only thing that can disrupt the influx of content is a malady or malfunction. Although it might take a miracle to heal these types of problems in humans, any competent user can usually resolve these matters in computers.

Read The Vital Signs. Input devices rarely cause serious trouble within a computer system. That fact shouldn't be too surprising. Keyboards, mice, trackballs, microphones, and most other input devices are relatively simple components designed to perform a single task. If one of these components starts misbehaving, odds are good that you can resolve its problem by performing the following five steps.

Step 1: Check connections. The first step you should take when you suspect that an input device is not functioning properly is to check its connections to the PC. Is it plugged into the correct port and is the connection secure? The keyboard and mouse or trackball usually connect to specially marked PS/2 ports meant just for them, but these devices also may connect to USB (Universal Serial Bus) ports (on newer computers) or serial ports (on older computers). Digital imaging devices typically connect to USB or FireWire (also called IEEE 1394) ports, and microphones plug into audio input jacks.

Some input devices also have power cords, and users should plug these cords into a functioning surge protector, wall outlet, UPS (uninterruptible power supply), or power strip. If you suspect that the input device is not getting electricity, plug a lamp or some other small appliance into the outlet to determine whether you have a broken circuit breaker or a local power outage or a malfunctioning surge protector, UPS, or power strip on your hands. You also should make sure the device's power switch is on (if it has one), and it doesn't have a frayed or damaged power cord.

For best results, turn the computer off while checking its cable connections. Also, never force a connector into a port. If you have trouble getting a snug and secure connection, check the cable connector and the port to ensure that you have aligned them properly and the connector doesn't have any bent or broken pins getting in the way.

Step 2: Start cleaning. Input devices are external peripherals and that means they're especially susceptible to environmental contamination. Dust can clog up the rollers inside your mouse or trackball. Drops of coffee or soda can make the keys on your keyboard stick. Oil from your fingertips can smudge the screen of your flatbed scanner. Fortunately, you can eliminate all of these problems with a little cleaning. See the "Clean Devices Work Better" sidebar for complete details about how to wash your input devices.

Step 3: Consider the situation. A computer system consists of all its parts and programs working together. Consequently, any assessment of an individual input device must take into account the state of the PC as a whole. Have you recently installed software or hardware on the system? Have you made changes to system files or the Windows **Registry** (a database of system settings and user preferences)? Did you spill something on the input device or drop it on the floor? Have you forgotten to check for computer **viruses** (self-replicating programs designed to destroy data or wreak havoc within a system) lately? All of these situations could trigger problems with an input device (or any other part of the system, for that matter). An honest assessment of the situation can help you develop a solution that works.

Step 4: Update drivers and applications. A smart thing to do when you encounter a problem with any component or peripheral is to update **drivers** (software that helps a hardware component communicate with the rest of

your system) for all of your system hardware. Similarly, you should see if there is a downloadable **patch** (code designed to fix known flaws in a program) available for any software you installed recently.

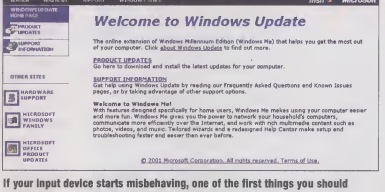
You can obtain these drivers and patches by visiting the Web site of each hardware manufacturer and software developer, which includes visiting Microsoft's Windows Updates Web site (http://windowsupdate.microsoft.com, or click its icon from your Start menu) to download the most recent updates and drivers for your version of Windows.

Actually, you need not wait for a problem to occur before updating your PC. We suggest checking the Windows Update site on a monthly basis and searching for other drivers and patches at least twice each year. You need to practice such vigilance because of the way your system ages as you introduce new technologies to it.

Step 5: Look for resource conflicts. A final step you can take is to open the Device Manager and look for resource conflicts that may affect the input device. You can access the Device Manager in Windows 98 Second Edition and Windows Me by right-clicking the My Computer icon on the Desktop, clicking Properties from the pop-up menu, and choosing the Device Manager tab in the resulting System Properties dialog box. To find the Device Manager in Windows XP, right-click My Computer (if it isn't on the Desktop, you'll find it on the Start menu), click Properties, choose the Hardware tab, and then click the Device Manager button.

Once you open the Device Manager, you need to double-click the relevant category, such as Keyboard if your problem is with a keyboard or Sound Video And Game Controllers if your problem is with a joystick. When the list of corresponding devices appears on-screen, look for icons next to each of them. If you see a yellow and black icon of an exclamation point next to a device, you can assume that Windows has identified a resource conflict between that device and some other device or program on the system. Select the input device, delete it (use the Remove command in Win98 SE, Delete in WinMe, or Uninstall in WinXP), and reinstall it on your computer. The process of reinstalling an input device varies. In some cases, you can simply reboot the computer and wait for Windows to detect the device and install the driver. In other cases, you also may need to run a setup program from the diskette or CD-ROM that came with the input device. Refer to the device's users manual for detailed instructions.

■ **Focus On Specifics.** When it comes to input devices, you can resolve most problems simply by running through the five steps we just discussed. But what should you do if the problem persists even after checking its connections, cleaning it, and taking the other prescribed treatments? Start focusing on the specifics.


Microsoft
Windows Update
About Windows Update
SEARCH
SUPPORT
msn
Microsoft
Welcome to Windows Update
The online extension of Windows Millennium Edition (Windows Me) that helps you get the most out of your computer. Click About Windows Update to find out more.
PRODUCT UPDATES
Go here to download and install the latest updates for your computer.
SUPPORT INFORMATION
Get help using Windows Update by reading our Frequently Asked Questions and Known Issues pages, or by taking advantage of other support options.
Welcome to Windows Me!
With features designed specifically for home users, Windows Me makes using your computer easier and more fun. Windows Me gives you the power to network your household's computers, communicate more efficiently over the Internet, and work with rich multimedia content such as photos, videos, and music. Tailored wizards and a redesigned Help Center make setup and troubleshooting faster and easier than ever before.
WINDOWS UPDATE HOME PAGE
PRODUCT UPDATES
SUPPORT INFORMATION
OTHER SITES
HARDWARE SUPPORT
MICROSOFT WINDOWS ME PANELS
MICROSOFT OFFICE PRODUCT UPDATES
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If your input device starts misbehaving, one of the first things you should do is visit Microsoft's Windows Updates site to download the most recent updates for your version of Windows.

Keyboards. Have you ever had to replace a keyboard because it stopped working? Probably not. These devices rarely fail outright. If the keyboard suddenly goes kaput and you've already ruled out a faulty connection as the problem, try plugging it into another computer. If the keyboard works, you can place the blame squarely on the shoulders of your system's motherboard; otherwise, you know it's time to replace the keyboard.

That's what you should do if the keyboard stops working altogether. If it simply stops working correctly—for example, several characters appear on-screen when you press a key once—you can assume a configuration error is most likely causing the problem. You can quickly resolve configuration errors by using the keyboard settings that are part of the Windows OS (operating system).

To review most of the keyboard settings, open the Control Panel (from your Start menu) and double-click the Keyboard icon (you'll find it in the Printers And Other Hardware category in WinXP). The resulting Keyboard Properties dialog box offers two tabs of settings: the Speed tab, which provides settings for the repeat rate and the repeat delay rate; and the Language tab (only in Win98 SE and WinMe), which identifies the primary language for the keyboard and determines the layout of the keys.

To access the language settings in WinXP, open the Control Panel and double-click the Regional And Language Options icon (from the Date Time Language And Regional Options category.

You will experience all sorts of typos if the repeat delay rate is set too short and the repeat rate is set too fast. The same is true if you set your keyboard's language layout to something other than English (unless you actually want to use another language layout).

More keyboard settings are available in the Accessibility Properties (called Accessibility Options in WinXP) dialog box, which you can access by clicking the Accessibility Options icon in the Control Panel. The Keyboard tab of this dialog box gives you the option of setting up StickyKeys (activates key combinations so you can press one key at a time), FilterKeys (ignores repeated keystrokes), and ToggleKeys (activates a beep whenever you press the CAPS LOCK, NUM LOCK, and SCROLL LOCK [SCRLK] keys). You can further configure these three accessibility options by clicking the Settings button that corresponds to each one.

Mice. As the PC's primary navigational device, a mouse is one very important piece of equipment. It facilitates the processes of interacting with data and surfing the Internet. It makes the act of computing a point-and-click pleasure instead of a key-command chore. It even helps small children and first-time users find their way around the Desktop. We cannot emphasize the value of the mouse enough. And that's why it's so darn frustrating when you find that yours doesn't work right.

Assuming that you already upgraded the mouse's driver, checked its connections, and completed the checklist you're supposed to follow when a problem strikes, the next thing you should do with a troublesome mouse is make sure the mousepad is clean. Brush away

any small debris (cookie crumbs, hair, and the like) that may disrupt the smooth roll of the mouse ball and clean up any sticky spills on the pad's surface; if the mouse ball cannot maintain a firm grip on the pad, its performance will suffer. Also, replace torn or tattered mousepads.

You should keep your mousepad clean regardless of whether you have a **mechanical mouse** (uses ball and rollers to detect movement) or an **optical mouse** (uses light and its reflection to detect movement). True, an optical mouse doesn't necessarily need a mousepad (unless your workspace is reflective enough to interfere with its operation), but it's important that you keep any surface clean while using an optical mouse so that you don't dirty the small window on the mouse's base plate.

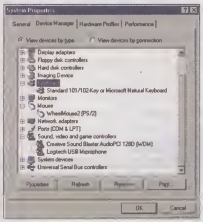
Next, check the mouse settings. You can view them by opening the Control Panel and double-clicking the Mouse icon (from the Printers And Other Hardware category in WinXP). Keep in mind that what you see when the Mouse Properties dialog box appears on-screen depends on the type of mouse you have and whether you installed any third-party mouse software on your PC. The following settings represent the most common mouse settings, but they may not be available to everyone.

Having said that, you should look at any available motion settings, especially speed and acceleration, if you think the movement of the on-screen pointer seems to be sluggish or out of control. The ideal settings for speed and acceleration rely on moderation: not too fast or too slow and not too high or too low. If you configure the speed or acceleration settings to any extreme, mouse performance will suffer. Mouse performance also will suffer if the orientation is out of whack. Reorient the mouse using an orientation setup tool to ensure that the pointer follows the movement of the mouse.

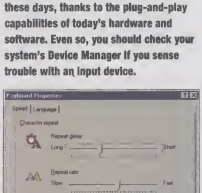
Another common problem concerns the mouse buttons. Examine the button settings if you find the mouse is not responding correctly when you try to left-, right-, or double-click something. You may set the buttons however you prefer, but the common mouse configuration has the left button set to Select and the right button set to Context Menu or Alternate Select. As for any remaining buttons (some mice come equipped with three, four, or more buttons), you can set them to perform other functions.

While you're checking the mouse buttons, you also should check the double-click timing because you might have trouble opening files and folders if the timing is set too fast.

A functioning mouse should work just fine once it's clean, connected, and configured properly. If your mouse continues to cause problems, you probably have a malfunction on your hands. Before throwing your mouse in the trash, try connecting it to another computer. If you have the same problems there, you can assume the mouse is ready for retirement and it's time to buy a replacement. But if the mouse works fine on the second computer, the problem might stem from your computer's mouse port. Contact the computer manufacturer for information about upgrading the mouse port.



Resource conflicts are relatively rare these days, thanks to the plug-and-play capabilities of today's hardware and software. Even so, you should check your system's Device Manager if you sense trouble with an input device.



You can use the Repeat Delay and Repeat Rate settings to fine-tune the way your keyboard responds to your typing tendencies.

In addition, some users mistakenly blame the mouse when the on-screen pointer freezes or suddenly disappears. In reality, this type of problem usually is the result of a glitch within the OS or a specific program rather than the mouse. Rebooting the PC should resolve most problems of this kind.

Trackballs, touchpads, and pointing sticks. Many users opt to use trackballs, touchpads, and pointing sticks instead of traditional mice. These devices tend to work best in situations where a mouse isn't feasible, such as with a notebook computer or on a crowded desk.

The process of troubleshooting a trackball, touchpad, or pointing stick is similar to that of troubleshooting a mouse. In order to provide optimum performance, the device must be clean and configured properly (use the mouse settings found in the Control Panel to configure any of these devices). If the device is clean and configured correctly and you continue to experience problems, the cause is probably a major malfunction that you won't be able to fix, forcing you to buy a replacement. You can replace a trackball with any other trackball or mouse on the market, but you should contact the manufacturer of your notebook computer to ask what the best method is to replace a built-in touchpad or pointing stick.

Gamepads and joysticks. Gamepads and joysticks are little more than souped-up computer mice that manufacturers rigged to provide maximum control within a game environment. As such, one of the problems you are most likely to encounter with a gamepad or joystick is identical to one of the problems you are most likely to encounter with a mouse: It doesn't do what you want it to do. For example, you push the fire button and your character jumps instead, or you push your character forward and it wanders idly off the side of the screen. If you want any chance of winning your game, you need a gamepad or joystick that works correctly.

To resolve this common problem, you should recalibrate the device and review the button settings. You can perform both of these tasks by opening the Control Panel and double-clicking the Game Controllers icon (also called Joystick, Gaming Options, or Gaming Devices; you'll find it in WinXP's Printers And Other Hardware category).

In addition, you should fine-tune the trim wheels on your joystick, if it has them. The **trim wheels** are small levers or wheels that let you adjust the horizontal and vertical movement of your joystick. Always recalibrate the joystick after adjusting the trim wheels.

If that doesn't work or the joystick fails to respond at all, you need to try something else (in addition to checking the Device Manager, as

discussed earlier in the article). Review the game's settings to make sure they recognize your gamepad or joystick as the preferred gaming device. Try plugging the gamepad or joystick into another gaming port on your system (your computer may have two: one on the motherboard and one on the sound card). If you use a Y-splitter cable with your gamepad or joystick, remove it and plug your gaming device directly into the joystick port. Finally, check the game's technical specifications to determine whether it supports your gamepad or joystick. If it doesn't, you may need to install a new gaming device or learn to play without one.

Microphones. The easiest input device to troubleshoot is a microphone. Why? Because there's not much that can go wrong with it. If you plug in your microphone and it doesn't work, you should review the sound properties to make sure you turned up the volume, turned on the speakers, deselected the Mute option, and configured the correct sound card on your system.

To access the sound properties, open the Control Panel and double-click the Multimedia icon (in Win98 SE), the Sounds And Multimedia icon (in WinMe), or the Sounds And Audio Devices icon (in the Sounds, Speech, And Audio Devices category of WinXP). Review the settings and choose the Voice tab (only in WinMe and WinXP) to access the Sound Hardware Test Wizard, which will guide you through the process of testing your microphone. You can open the wizard from the Voice tab by clicking the Voice Test button in WinMe or Test Hardware button in WinXP.

Another way to test the mic is to launch the Sound Recorder utility and try to record an audio clip. To find it, open the Start menu and click Programs (All Programs), Accessories, and Entertainment.

If your sound recording configuration is correct but your microphone still doesn't work, disconnect the microphone from your system and try using it on another computer. If your microphone fails to work on two or more systems, you'll need to replace it. But if your microphone works on the other system, it's possible you have a bad sound card on your hands. Contact the sound card manufacturer for assistance.

Scanners. Mice, keyboards, and most other input devices merely interpret actions and commands. For instance, when you want to open a file on your hard drive, all you have to do is move your mouse your on-screen pointer hovers over the file and click a mouse button. Such input devices are simple, both in function and composition, so they are unlikely to wear out or break down.

Scanners, on the other hand, have the complex task of converting text documents and photographs into digital data and then feeding that data—sometimes millions of bytes worth—into the PC. These devices have plenty of fragile moving parts and even more settings, making them particularly susceptible to a variety of mechanical and configurational problems. The truth is that you may be in for a lot of head scratching if your scanner quits working properly.

You can resolve many scanner-related problems by following the five initial steps we described at the beginning of this article. Then, if those don't work, you can focus your attention on addressing specific problems that are common to scanners.

One such problem is a scanner that won't scan. After checking to make sure the power switch is on, you should check the scanner's carriage lock. The carriage lock secures a flatbed scanner's fragile scanning mechanism, preventing it from rocking back and forth when you move the scanner. You should engage the carriage lock whenever you need to relocate the scanner, but you

Clean Devices Work Better

Sometimes the only thing between you and a properly working input device is dust, smeared fingerprints, or a layer of oily grime. Before you put too much energy into your next troubleshooting showdown, power down your PC, unplug your input devices, find some cleaning supplies, and give those input devices a good scrubbing. This might just be enough to do the trick.

Mice. If you use a mechanical mouse, turn it over and remove the plastic cover that holds the ball in place. (You can remove the cover on most mice by pressing it down and turning it counterclockwise.) Take the ball out of the mouse and clean it with a damp lint-free rag. Set the ball aside to dry. Next, dip a cotton swab in rubbing alcohol so it's only *slightly* damp and wipe the three rollers located inside the mouse (being careful not to drip any alcohol, which could harm the mouse's inner circuitry). Use your fingernail to remove any grime that sticks to the rollers. Wait for the alcohol to dry, blow into the mouse cavity, and replace the cover. As a general rule, optical mice don't need cleaning.

Trackballs. A trackball is an upside-down mouse. To clean it, use the same suggestions given for mice and remove the collar that holds the trackball in place. Remove the ball and clean it. Clean the rollers inside the trackball, blow any loose residue out of the trackball, and replace the ball and collar.

Keyboards. Turn the keyboard upside down and gently shake out any hair, dust, and other loose particles that have accumulated inside it. You also might want to use a can of compressed air (available from most office supply stores) to blow air directly between the keys to remove debris. Wipe dirty keys with a damp cotton swab dipped in rubbing alcohol (again, being careful not drip alcohol inside the device). If your keyboard is particularly dirty or you spilled liquids on it in the past, you can remove the keys and carefully wipe the area behind them. Make sure you let the keys dry and put them back on the keyboard in the correct order (using ice cube trays to separate the keys in the proper order often helps).

Scanners. Spray a mild cleaning solution (avoid ammonia-based cleaners) onto a lint-free cloth and wipe the scanning surface. Take special care not to let any liquid seep around the edges of the scanning surface and drip onto the scanning mechanism. Dry the scanning surface using a dry lint-free cloth if necessary. Do not attempt to clean the underside of the scanning surface until you contact the manufacturer for specific instructions about how to accomplish this.

Other input devices. Dampen a lint-free cloth with a mild cleaning solution, such as rubbing alcohol or dish soap diluted in water, and wring it out. You can use this cloth to wipe the plastic parts of any input device, being careful not to let any liquid seep inside the device. Wipe the device dry with a clean lint-free cloth. If you think any liquid leaked into the device, let it air dry for at least one day before using it again. ☐

must remember to disengage it before you try using the scanner again.

You also should make sure the scanner is sitting on a level surface. The scanning mechanism may not function if the scanner is sitting at an angle. If all else fails, turn the scanner and computer off, wait about 10 seconds, and then turn them back on (turn the scanner on before booting the PC) to reset them.

Another scanner-related problem that you may encounter concerns producing scanned images that display the wrong colors or appear blurry. The most likely cause of problems like these is an incorrect software configuration. For example, the colors may seem out of kilter if your image-viewing software is set to display anything less than 65,000 colors. You can improve the appearance of your scanned images by changing the program's color setting to support 16-bit or 24-bit color.

If your images appear to be out of focus, it may mean that the scanning resolution is set too low. The resolution determines how many **pixels** (picture elements; dots of light arranged in such a manner that they appear connected and form an image) create an image and how far apart those pixels are. The resolution must be set high enough to ensure that an adequate number of pixels are available to capture and present all of the details contained in a given image. If it isn't set high enough, elements of the image will be missing and the image will appear blurry. Because the ideal resolution depends on the size of the image and how you plan to use it, there are no hard and fast rules about setting a resolution. We suggest that you increase the resolution incrementally until you find a setting that eliminates the problem.

An incorrect resolution may also affect the scanner's OCR (optical character recognition) capabilities. If the OCR software refuses to recognize the text you're scanning, make sure the scanner is set to a resolution of at least 300dpi (dots per inch) and the text document properly aligns on the scanning surface. You will see a better OCR performance if you scan documents that:

- have black text on a white background,
- appear on plain rather than glossy paper,
- are free of all blemishes, including staple holes and small rips, and
- have all the text in one column.

After you complete a scan, you may encounter yet another problem: The computer may refuse to save the scanned image. This problem, which manifests itself in the form of error messages indicating a lack of hard drive space or insufficient system memory, is most likely to occur when you scan large images at a high resolution. You can take the stress off your system and work around this problem by reducing the resolution for your next scan. You also can try saving the file in a compressed format, such as JPEG (Joint Photographic Experts Group) or GIF (Graphics Interchange Format), rather than the byte-heavy TIFF (Tagged Image File Format).

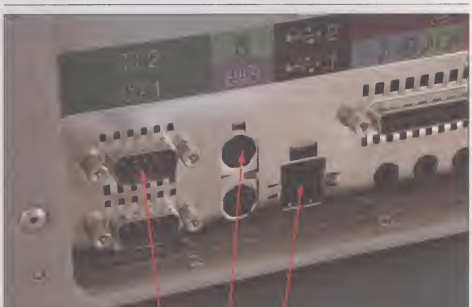
Mouse Properties
Quick Setup | Pointers | Buttons | Motion | Orientation | Devices
Orientation Setup
Move the pointer in the direction of the clouds
Press the ESC key to cancel the process
OK
Cancel
Apply
Help

The fastest way to put a wandering mouse back on track is to reorient it with the help of an orientation tool such as this one. Simply use your mouse to drag the balloon up to the clouds, and the mouse software takes care of the rest.

■ **If You Can't Repair It, Replace It.** The last step in any troubleshooting sequence is to contact the product manufacturer and ask for technical assistance. Professional technicians can help you identify and resolve problems that are specific to your device. They also can tell you when to give up on your attempts at resuscitation and start thinking about a replacement.

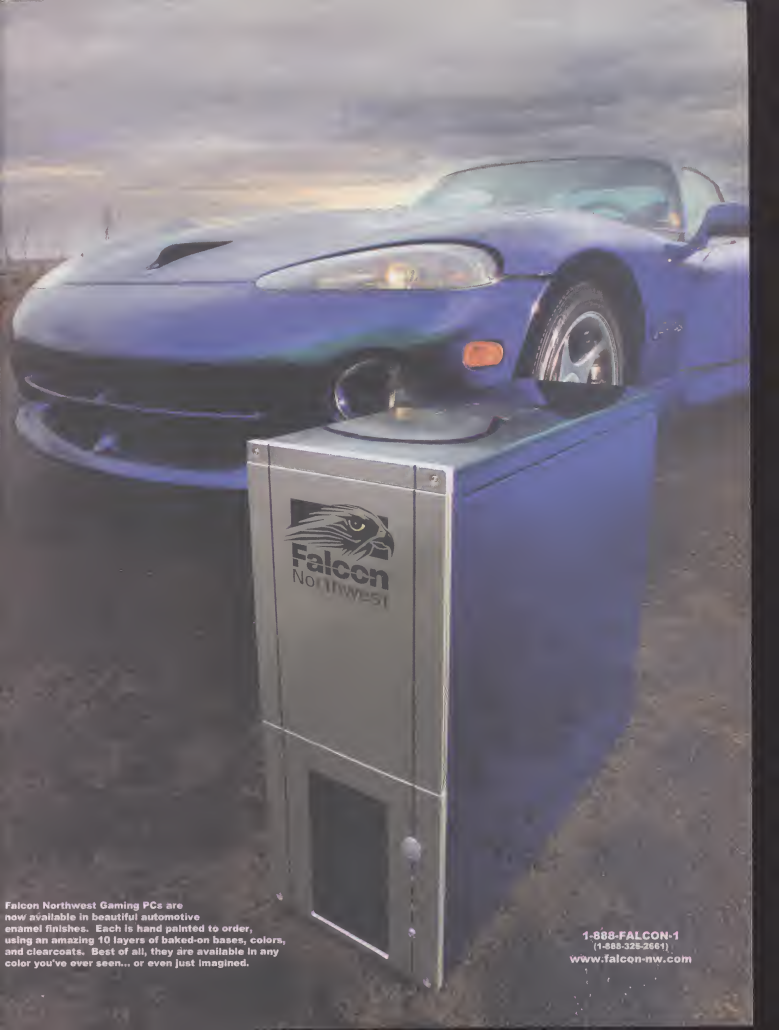
The good news is that input devices are among the least expensive components for a PC. Mice, keyboards, and gaming devices routinely sell for less than $20; some types of scanners cost slightly more, with prices starting at $50. Think of it as an "input tariff" for getting much more reliable data into your PC. LS

by Jeff Dodd



Neither your mouse nor your keyboard will work if you connect them to the wrong port. The most common ports for these input devices are:

Serial PS/2 USB (Universal Serial Bus)



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Conflicts Among IRQs & Devices

Improve Communication & End Territorial Squabbles

Realizing you're only seconds away from installing your new, feature-packed sound card, you tear the shrink wrap off its box with wide-eyed anticipation. After only a few minutes, you have the device mounted and ready to go, so you decide to boot your computer, launch your MP3 player, click a song to play it, and in a fraction of a second you hear . . . nothing.

Welcome to the wonderful world of device conflicts. Sure, devices should work alongside each other and never interfere with their neighbors' business, but your computer has only so many resources for all of these devices, and when two devices try to simultaneously use the same resource, one or both devices could refuse to work.

Your chance of experiencing a conflict increases as you add more devices to your computer, but that doesn't mean you *shouldn't* add devices. Instead, read on for a primer about conflicts and how to solve them when they rear their ugly heads.

The Science Of Conflict. The CPU is your computer's traffic cop. All of your system's components, including sound, video, and network resources, vie for the CPU's approval to perform different actions at different times. To facilitate a seamless computing environment, the devices have a direct communication pipeline with the processor, which lets them execute their actions as needed.

These devices flag down the CPU using IRQs (**i**nterrupt **r**equest **q**ue**s**t **l**ines), which are direct paths to the CPU itself. Your system reserves particular IRQs for components such as the system timer, keyboard, serial ports, diskette controller, printer, CMOS (complementary metal-oxide semiconductor) real-time clock, mouse port, hard drive controller, and others. Your system reserves other IRQs for general use, which it typically uses as you install more components (or some IRQs might remain reserved for components you never even use).

The original x86 computer architecture called for 16 IRQs, which allowed for the efficient use of 16 components. The system assigned an IRQ, ranging from 0 to 15, to each

component and that was that. But devices pack today's computers, and even though this basic IRQ architecture is still in use, it occasionally has trouble keeping up.

Many older, nonplug-and-play devices reserve only one IRQ. Several newer devices, however, can share IRQs as needed, which provides flexibility regarding resource usage. Depending on your configuration, you mix newer and older devices in your system or only use all old or all new devices. In any of these configurations, conflicts can occur when two devices try to use the same IRQ but can't share it.

Although most modern motherboards do an admirable job of handling multiple devices, the fact remains that the more components you have, the more resources you need, and this increase in resource requirements can cause devices to clash when they're trying to do their jobs.

Resolve Conflicts. To address hardware conflicts, you'll need to do some investigative work. If you recently installed a device that apparently doesn't work with your system, or if that installation caused another device to stop working, a couple of devices are likely trying to access the same system resources. Windows has built-in troubleshooting capabilities that can help you target conflicts, so it's wise to use them first to try and track the problem.

In most cases, your first step should be to access the Device Manager. To do this, right-click the My Computer icon on your Desktop and click Properties. In Windows 98 Second Edition and Windows Me, choose the Device Manager tab. In Windows XP, choose the Hardware tab and click the Device Manager button.

If the Device Manager detects a problem with a device, it will display a warning icon next to the listing of the device. For example, if your sound card isn't working, you should see a warning icon beside the Sound, Video, And Game Controllers branch.

Windows uses different types of warning icons to initially clue you in to the type of problem your system is experiencing with a device (or devices), but the symbols themselves are vague. According to Microsoft, a black exclamation point on a yellow background means that the device is in a "problem state." A red "X" indicates that the device is disabled, even though it's physically installed and/or using system resources. A blue "i" means that the Use Automatic Settings feature isn't active for the device, although this doesn't necessarily mean the device isn't working. A problem code (or a green question mark in WinMe or WinXP) could indicate a possible driver problem.

Double-click the device in question and look at the Device Status area on the General tab. If a device is functioning properly, the Device Status area will display a "This device is working properly" message; but if your device has a warning icon next to it in the Device Manager, Windows should indicate the reason for the

warning icon in the Device Status area. If Windows lists a reason here, choose the Resources tab and look at the Conflicting Device List area. Whenever a device has a hardware conflict, this area should indicate which component is interfering with the device.

The Resources tab also is where you'll see the Use Automatic Settings checkbox. So, if a device isn't working and you noticed a blue "i" next to its listing in the Device Manager, select the checkbox next to Use Automatic Settings, click OK to close the dialog boxes, and reboot your computer. On the other hand, if the Use Automatic Settings checkbox already has a check mark but the Device Manager still indicates that there is a hardware conflict, write down the displayed information (as well as any conflict details you notice for other devices with warning icons next to them) and close the Device Manager.

If you use WinXP, you'll notice that there's a Troubleshoot button on the General tab of every device's Properties dialog box (via the Device Manager). If you're not comfortable troubleshooting the problem yourself, or if you've run out of ideas, click this button to launch a wizard-like troubleshooter that can help you locate the problem.

■ **Install It Again.** Even if you do a flawless job of installing a hardware device, your system could still refuse to use it. Because of this, it's sometimes necessary to coax the computer into using a device by simply reinstalling it.

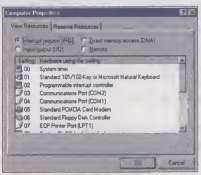
To reinstall a device, you'll need to uninstall it first. To do so, shut down and unplug your computer and then remove the device, being careful to follow the same procedure you used when you installed it.

(NOTE: Of course, whenever you open your computer case, you must be extremely careful. Turn off your computer, unplug it and all of its peripherals from the surge protector and wall outlet, and disconnect the power cord and all other cables from the computer. After removing the case's outer lid, ground yourself by touching an unpainted metallic surface outside your case's metal frame. This will prevent a static discharge from damaging internal components when you touch something inside the case.)

When you finish, restart your computer, open the Device Manager, and browse to the entry for the device you just removed (it should have a warning icon beside it). Select it, click Remove, and reboot your computer if prompted.

If you installed any software for your device, uninstall it using the software's uninstall utility (if it came bundled with one) or the Add/Remove Programs utility from the Control Panel. Reboot your computer and make sure there aren't any traces of the hardware device or its software on your system.

Shut down your computer again, and then reinstall the hardware device following the manufacturer's instructions. If you are installing a PCI (Peripheral Component Interconnect) or ISA (Industry Standard Architecture) add-on card, use the same slot you used during the original installation. When you finish, reboot your computer. (If the device was something other than a PCI or ISA card, skip ahead to the following section, "Dig A Little Deeper.")



IRQs (interrupt request lines) serve as lines of communication between devices and the CPU. If two devices try to access the same IRQ, a conflict could cause one or both of them to stop working.

If your recently installed device isn't working but doesn't show conflicts via the Device Manager (where to access a device's Properties dialog box), you'll need to dig deeper to find the problem.

If the device still refuses to work correctly after reinstalling the PCI or ISA card, shut down your computer, follow the same steps to uninstall the device, and try installing it in a different slot. If another slot isn't available, swap it with an existing device. Reboot your computer and try to use the device again.

■ **Dig A Little Deeper.** Computers are complex mechanisms. Although you may have properly installed a device and Windows reports that the device *is* working, you know that it isn't (despite what Windows claims). Perhaps problems within the **BIOS (Basic Input/Output System;** contains settings for most of your computer's components) are what's actually causing the device not to work. And because these problems have roots within the BIOS, Windows might have difficulty detecting them.

If you're not able to solve your device conflict using the aforementioned tactics, try a different approach: When you boot your computer, take note of the device information listed on initial boot screen. To do so, pause the screen by pressing the PAUSE/BREAK key on your keyboard. (If this key doesn't work, read the instructions from your motherboard or computer manufacturer to see which key or key combination will pause the screen.) This information should point to a possible problem source. Plus, you'll see a listing of devices and their IRQ designations here. Even so, if your BIOS configuration lets Windows handle IRQ routing (instead of the BIOS handling this task), this information could vary from the IRQ details that Windows reports.

With this in mind, you should inspect your BIOS settings to see how the BIOS is treating the process of IRQ reservations. To enter your BIOS setup utility, turn on your computer and press (sometimes, repeatedly) the appropriate key when the first screen displaying system information appears on-screen. The "appropriate key" you need to press depends on your system. For some, this key is ESC, DELETE, or F10. If none of these keys work, consult your users manual or the PC manufacturer's Web site to find information about the correct key. If your computer manufacturer has implemented a splash screen to hide this information screen, you can typically bypass it by pressing TAB as soon as you see the splash screen appear.

After you enter the BIOS setup utility, tread carefully: Changing BIOS settings can have drastic consequences, including stopping your computer from booting. If you do make any changes, write down the original settings so you can revert back to them if the new settings cause problems.

In the BIOS setup utility, you'll typically see an initial screen, with the option to scroll through other screens, all of which are full of settings. Scroll through the screens using the TAB or Arrow keys, or whichever keys your BIOS designates for navigation. Look for a setting called Plug And Play OS, PNP OS Installed, or something similar (this setting is usually found in an area called PNP/PCI Configuration). Regardless of what this setting's name is, if it's set to "Yes," Windows will manage all of your IRQ resources. If you're having problems with your devices and can't resolve them in Windows, try toggling this setting to "No" (typically, using the PAGE UP/PAGE DOWN keys to change settings). Doing so will let the BIOS assign IRQs to devices, instead leaving this task up to Windows.

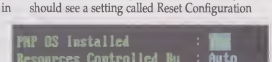
Because computer configurations can vary widely, it's difficult to surmise which option will work for the PNP OS Installed setting on your computer. In most cases, letting Windows handle IRQ configurations works fine, but in special cases, you might have to rely on the BIOS to handle this task. Keep in mind that changing this setting could cause problems with other devices. If you change this setting and your device doesn't work (or other devices become disabled as a result), change it back.

Other settings available in the BIOS setup utility also can help solve conflicts. If you're not using any USB hardware, find a setting called Assign IRQ For USB (or something similar) and set it to Disabled. Doing this should free up an IRQ for your new device(s). In addition, make sure that Assign IRQ For VGA is set to Enabled because all modern video cards need an IRQ. After making changes in your BIOS setup utility, find a setting called Save And Exit Setup; choose this setting and reboot your computer with the new settings enabled.

If you don't use your serial port, this is something else you can try to disable via the BIOS setup utility. Look for a setting called Onboard Serial Port 1 and set it to Disabled. Alternately, you can disable the serial port by disabling COM1 in Windows. Open the Device Manager, expand the Ports branch, double-click Communications Port (COM1), and select the checkbox next to Disable In This Hardware Profile. Click OK, close the Device Manager, and reboot your computer.

If you're not sure if any devices use your system's USB or serial ports, *don't* change these settings because doing so might disable devices you use on a regular basis. But if you're certain you don't use them, disabling these ports can free up precious IRQs.

Finally, if you run into serious problems after making changes in your BIOS setup utility, enter the setup utility again and return to the PNP/PCI Configuration area. Here, you should see a setting called Reset Configuration Data. Set it to Enabled to make the BIOS start from scratch and reconfigure all of your system devices. Not only is this setting useful for correcting mistakes you've made in the BIOS setup utility, you also might find that it corrects the original device problem(s) because it forces the BIOS to take a new look at the configuration for all your devices.



Setting the PNP OS Installed setting to "No" in the setup utility for your BIOS (Basic Input/Output System) will direct it to control the IRQ (interrupt request line) settings for your devices.

An outdated BIOS (Basic Input/Output System) can cause hardware conflicts, so if you've tried everything else, visit your computer or motherboard manufacturer's Web site to see if there's a BIOS upgrade available for your system.

■ **Update Your BIOS.** If you've tried everything and you're still experiencing hardware conflicts, the BIOS itself could be to blame. Although your system's manufacturer probably intended for your BIOS to last the life of your computer, the BIOS might need updating in certain cases. In fact, many popular BIOS manufacturers update their BIOSes on a regular basis, so if you're trying to keep your computer thoroughly updated, it's not a bad idea to look for BIOS updates every six months.

As long as your motherboard isn't ancient, the BIOS should be flash-upgradeable. If so, you can use a small program to update the BIOS. Decompress this program onto a series of floppy diskettes, and then use these diskettes to reboot your computer and complete your BIOS update outside of Windows (at the command prompt that appears onscreen), which is useful if device conflicts are causing severe problems in Windows.

To see if you can update your BIOS, contact your computer manufacturer (either by phone or by visiting its Web site). If you're not sure who built your computer (and you don't have a users manual), you can find out by opening your computer case (using the proper precautions, of course), writing down the name and model of your motherboard, and visiting the motherboard manufacturer's Web site (search for BIOS updates in the support section).

Because updating your system's BIOS is an extremely sensitive process, you need to know exactly what you're doing before you begin. Therefore, you should find and print the BIOS update instructions from your computer or motherboard manufacturer's Web site before you begin the process. And, just in case, keep the Web address of BadFlash.Com (http://www.badflash.com) on hand if you run into problems booting your computer after updating your BIOS.

■ **Find A Resolution.** Have you ever had the feeling that your computer enjoys conflict, even if it's just to make your life miserable? Perhaps there are a few ill-intentioned computers out there, but most make an honest attempt at creating a harmonious computing environment.

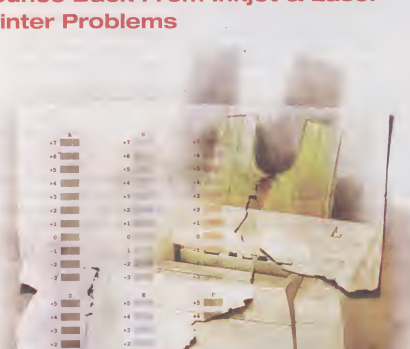
You can help your computer's quest for harmony by installing new devices one at a time, booting your computer after each installation, and letting Windows properly configure one device before moving on to the next in line. This strategy can also work if you're having problems with only one device, but in that case, you might want to remove all nonessential devices (such as your sound card, network card, modem, etc.) and let Windows configure each device, one at a time.

When a conflict occurs, remember that it's usually just a minor hassle that you probably can solve rather quickly. So, take a deep breath, use the steps we outlined in this article to investigate the problem, and you'll soon be experiencing device harmony once again. LS

by Christian Perry

In Mint Printing Condition

Bounce Back From Inkjet & Laser Printer Problems



We have all heard of the power of the printed word, and we also know that a picture is worth a thousand words. It can be frustrating, then, when printer problems stand in the way of print communication. If you use a calm, rational approach to track down and correct your printer problems, you can avoid unnecessary inspections and repairs. And of course, the sooner your printer is running again, the sooner you can print those powerful words and pictures that speak volumes.

Troubleshooting 101. Even if you know very little about printers, you can rule out many causes by using a logical approach to problem solving. For instance, you can determine if the problem relates to hardware or software. The truth is, you probably know more about troubleshooting than you realize.

Let's assume, for example, that you wear headphones and listen to a portable radio while you jog each morning. One day, the music crackles, fades, and stops playing altogether. Of the following options, which should you do: a) panic, pull out your cell phone, and call the manufacturer's technical support line; b) turn around, jog back home, pull out your screwdriver, open the radio, and look for a bad circuit; or c) open the battery compartment, replace the old batteries with a new set, and see if the music starts playing again?

If you answered "c" (check the batteries), you already know how to problem-solve. You didn't panic and assume the worst. And you didn't investigate time-consuming or expensive options before checking the obvious and easy fix.

Similarly, when your printer gives you trouble, there's no reason to assume that the problem is something complicated that requires you to have an electrical engineering or computer science degree. So, there's no point opening your printer's case to look for a broken component if you simply forgot to turn the power on.

Unless you know the cause of your printer mishap, you should always investigate the possibilities that are easiest and quickest to confirm or disprove. Follow each of the guidelines below until you find and solve the problem.

1. Begin by investigating anything that is easy to check and fix.
2. Next, look into anything that is easy to check but maybe not so easy to fix.
3. Next, investigate anything that takes some time to check but would be easy to fix.
4. Finally, check the more complicated possibilities.

Printers vary from model to model, not only in their physical setup but also in their drivers and bundled print utilities. Because of these differences, we cannot provide you with all the answers to your printer problems. What we can do is walk you through the process of troubleshooting a few common printer problems to demonstrate a logical approach to any difficulty you may encounter. Remember that it's important to always consult your users manual, not only to learn the specifics of your model but also to ensure that you don't void your warranty.

When Nothing Prints. We'll start by walking through a common printer problem: nothing will print. We'll try to start with some of the easiest things to check and/or correct and gradually move on to the more advanced troubleshooting.

Power supply. Check to see if your printer's lights are on. If not, is the power switch in the On position? Then again, your printer may not have a power switch; some printers turn on automatically as systems need them and then turn off when not in use. Finally, turn off your computer and printer and make sure the power cord is plugged securely into the wall socket (or surge protector) and the printer.

Check the cable. Next, make sure a cable connects the printer to the PC and the connections aren't loose. If the cable has screws, use

them to secure the cable. If, after restarting the computer and turning on the printer, the printer still doesn't work, you can shut down your computer and printer and try a different USB (Universal Serial Bus) or parallel cable. This will help you confirm or rule out whether a cable is defective.

Test page. If your printer lets you print a test page, this is an excellent way to test basic communication between Windows and your printer. (The method of printing a test page varies from printer to printer.) If the test page prints, you know the printer works.

Application test. Open a second program and try to print a document. If you are able to print a document from the second program but not the first, you can rule out a general hardware problem because the printing dilemma is somehow linked to the first program you used. Open the first program again and check its print setup configurations. In most programs, you'll find the Print Setup or Page Setup option in the File menu. You also may find a Print Setup, Page Setup, Options, or a similar button in the Print dialog box (which you open by clicking Print from the File menu). Make sure you select the correct printer from the available settings.

Ink cartridge. If you just replaced an ink cartridge, make sure you removed the adhesive strip. If you haven't, the strip will prevent ink from reaching the paper.

Paper jams. One of the most common causes of printer problems is a paper jam. In fact, we could probably devote an entire article to paper jams. These nuisances occur frequently because slightly crinkled or otherwise damaged paper tends to become jammed in the rollers that pull paper through a printer. Use only flat paper with straight, unbent corners to avoid jams. Also, check your printer's documentation to confirm that the paper you use isn't too thick or slick for your model.

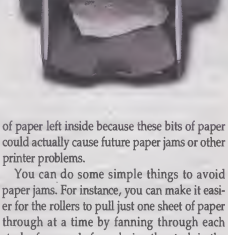
How can you tell if a paper jam exists in a printer? In larger laser printers, several mechanical parts often hide a jammed paper (or papers) from sight. If you use an inkjet printer, however, you'll be able to see most of its paper jams. Paper jams in inkjet printers can occur either while exiting the feeder tray or coming out onto the output tray; you'll see paper pulled partway through or at an angle.

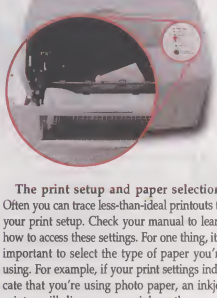
Many printers confirm the paper jam with a blinking light on the printer, an error message on the printer's LCD (liquid-crystal display; if the printer has an LCD), and/or an error message on your computer's monitor screen (or LCD). If the printer's LCD or your computer's screen displays instructions for removing the paper jam, follow those directions. If not, consult your users manual. Generally, you can remove a paper jam from an inkjet printer by unplugging the printer and gently pulling the jammed paper(s) out.

If the paper is stuck in a laser printer, you need to exercise more caution. Open the compartment door and check for jammed paper(s). If the paper is near the paper feed tray, you may be able to pull it loose immediately. However, if the jammed paper is in or near the printer's fuser assembly, you must turn off the printer, shut down your computer, and wait for the printer's components to cool. Laser printer parts can become extremely hot. Avoid injury by waiting until you can safely remove the paper.

Regardless of whether the paper jam occurred in an inkjet or laser printer, you also may need to open the compartment door on the front of the printer and remove any shreds of paper left inside because these bits of paper could actually cause future paper jams or other printer problems.

As you can see here, paper jams are usually visible in an inkjet printer (left) but often remain hidden in a laser printer behind its front compartment door.





You can do some simple things to avoid paper jams. For instance, you can make it easier for the rollers to pull just one sheet of paper through at a time by fanning through each stack of papers before placing the stack in the feeder tray.

In addition, never place more paper in a feeder tray than its maximum capacity; check your manual for the exact amount. Similarly, make sure that the stack of papers in the output tray is not past capacity. For instance, if your output tray has a 50-sheet capacity, make sure you don't let more than 50 sheets stack up on it. This can create an obstacle to outgoing printouts and cause papers to become stuck in the printer and jam.

If your printer has special levers, switches, or trays for special paper types, make sure you use them. If there is a paper/envelope switch, make sure it is in the correct position, as this usually alters the angle at which the media feeds into the printer.

High humidity can wreak havoc with paper. When sheets get moist, they tend to curl. As with folded or crinkled paper, curled paper can also misfeed. Running an air conditioner in your work area may combat humidity problems. You might want to store your paper in a dry area and only bring it into your workspace when you're ready to print.

■ **Bad Print Quality.** Bad print quality can mean many different things. Sometimes the print appears pixelated, too light, too dark, too grainy, or even speckled or streaked.

The print setup and paper selection. Often you can trace less-than-ideal printouts to your print setup. Check your manual to learn how to access these settings. For one thing, it's important to select the type of paper you're using. For example, if your print settings indicate that you're using photo paper, an inkjet printer will dispense more ink on the paper, which will usually lead to a smudgy, bleeding quality on standard inkjet paper.

Not only should the paper type and print settings match, but you also should make sure you're using an appropriate paper type. If you feed standard inkjet paper to a photo printer, expect to get less-than-photo-quality prints. But be sure that any paper type you choose

conforms to the approved paper types listed in the users manual. After all, using paper that's too thick or slick can lead to paper jams.

Prevention. If you wait too long between printing sessions, your inkjet's ink may become dry. Although you can't really check to see if this is the problem, you can easily avoid this problem in the future by printing something—even a tiny multi-color graphic—each week. This precautionary measure will ensure that you get the most out of your ink cartridges.

Cartridge life. Just like jugs of milk and jars of mayonnaise, ink and toner cartridges have expiration dates (usually printed on the box), after which you take a chance with print quality. If your cartridge expires, replace it with a new one and try printing again.

Although this probably goes without saying, make sure you are using a cartridge designed for your printer. Just because it fits in the ink cartridge compartment doesn't mean that it will work appropriately with your printer and software.

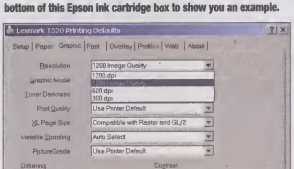
Lint and other print head issues. To avoid smudgy or streaked prints, check paper packaging and never use a linen-based paper. Why is this so important? As a linen-based sheet of paper moves through a printer, it can leave behind tiny bits of lint, which accumulate on your printer's components, including the rollers and print head. Streaks and specks on printouts are often the result of ink-soaked pieces of lint.

If you've used linen-based paper, you might want to check for lint and other bits of debris left inside the printer. Some printers have a button you can press to clean the print head. Other printers have a software utility that cleans the print head. Either way, cleaning the print head often removes much of the debris that accumulates.

If, after cleaning the print head, you still encounter streaks, you may need to open your printer's case to physically remove lint and other items. If you have to do this, read your users manual first and follow all instructions to the letter. You don't want to void your warranty or injure yourself.

Wrong colors. You may occasionally notice that printouts are not the correct color. For instance, in your family photo, everyone and everything may appear slightly blue. If you're sure the original image isn't the problem, you can do a few different things to solve the problem. First, if your printer has a utility that monitors ink levels, make sure that none of the inkwells are empty. For instance, if the red inkwell is empty, a photo will have a bluish tint. Second, if the ink levels appear acceptable, try cleaning the print head as we described in the previous paragraph. Perhaps some pieces of debris are blocking one of the colors. Finally, if colors are still inaccurate, make sure the print head aligns properly. (Read the next paragraph to learn about print head alignment.)

Just because it isn't edible doesn't mean it doesn't have an expiration date. We highlighted the expiration information on the bottom of this Epson ink cartridge box to show you an example.



Most printers let you adjust the printer resolution in a Print Setup dialog box or through your printer's properties dialog box.

Alignment problems or banding. If part of your document prints on the wrong part of the page or you notice banding or inaccurate colors, the problem could be a misaligned print head. Different printers check and correct alignment differently: Some have a button you press to print an alignment page; others have an alignment software utility, usually found on either the Print or Page Setup dialog box.

Resolution. You also may want to adjust the resolution setting to see if that improves print quality. If you don't see a resolution or dpi (dots per inch) setting in either the Print or Page Setup dialog box, you can access the resolution setting by clicking Start, Settings, and Printers in Windows 98 and Windows Me. In Windows XP, click Start, Control Panel, Printers And Other Hardware, and Printers And Faxes. Right-click your printer's icon and click Properties from the context menu. In the resulting dialog box, find the resolution setting and increase the dpi if possible. Click OK.

■ An End To Printer Troubles.

There is another action you can take that often solves printer problems: Install updated drivers. A printer driver is the software that facilitates communication between your printer and computer. Manufacturers routinely release new drivers that either correct problems with earlier versions or add features. Check the manufacturer's site for updated drivers, which are usually found in either a Drivers or Downloads section.

If you use WinXP, you can try one more trick to nail down the cause of printer problems: a Printer Troubleshooter. To launch this wizard-like troubleshooter, click Start, Control Panel, Printers And Other Hardware, and Printing (located in the left pane under Troubleshooters). The troubleshooter will ask a series of questions. For each question, click the radio button next to the best response and click Next and the troubleshooter will guide you to the most likely answer.

There are too many variations in printer models and their associated print utilities for us to cover all printer problems. However, by eliminating the simplest explanations first, you can narrow down your search. Even in a worst-case scenario in which you have to call technical support, you can reduce the time and money spent online by pinpointing potential problems before picking up the phone. LS

by Kylee Dickey

Chill Out

Ways To Cool Off Your Overheated PC

People and computers do have a few things in common. Both computers and people can be temperamental, both can catch a virus, and both hate to endure too much heat. Of course, many of us love to cool down with a nice swim, which really isn't an option for computers.

Next to that swim, a PC's biggest enemy is heat. Over time, heat can damage the delicate electronics inside a PC, shortening a system's life span. If you want to protect your investment, you'll want to keep your system as cool and comfortable as possible.

■ **Hot Stuff.** Heat is a by-product of activity. When you're reading, watching television, or sitting at your desk, your body maintains its 98.6-degree internal temperature. When you begin exercising, your internal temperature rises as you exert yourself.

The same holds true for PCs. Electrons carry information from one part of the system to another and encounter resistance as they move. This resistance manifests itself as heat. The more information the PC ushers around, the hotter the system can become.

Today's faster processors are a major source of heat within a computer. Processors such as AMD's Athlon and Intel's Pentium 4 require reliable cooling processes to function properly. Graphics cards are becoming a second major heat source as graphics chips begin to run at faster and faster speeds.

A processor's clock speed partially determines how much heat it generates. A 2.4GHz processor will push electrons faster than a 2.2GHz processor, making the 2.4GHz processor the hotter model of the two processors.

Clock speed, however, is not a direct indicator of heat. The size of the processor's core also plays a part. Manufacturers have consistently shrunk the features etched into a processor's core. These features, measured in **microns** (millionths of a meter), have an impact on a processor's power requirements and the heat a processor generates. As features become smaller, less power is required to move data. This makes a processor more energy-efficient and reduces the amount of heat it generates. A 0.13-micron processor, such as Intel's latest line of Pentium 4 processors, will use less energy and generate less heat than an older 0.18-micron processor.

■ **Hot Under The Collar.** When you see steam rising from the hood of your car, you know it's a good idea to pull off the road for a bit. There also are few telltale signs of an overheated PC.

When pushed beyond its tolerance, a PC can exhibit any of a number of various symptoms. Some symptoms, including the dreaded Blue Screen of Death (jargon for a Windows system error that displays as a blue screen with an arcane error message), frozen or hung computers (computers that don't respond to any input), and frequent application crashes can sometimes be the by-product of an overheated PC. All of these symptoms, however, have other causes not necessarily related to overheating. Additional symptoms include random restarts or computers that suddenly switch off while in use.

For more concrete diagnostics, you can turn to temperature sensors and probes. Because heat is such an important issue, some motherboards include built-in temperature probes that monitor the processor temperature. Occasionally, you can access this information from within Windows using special software the motherboard manufacturer provided. In some instances, however, you'll need to access the system's BIOS (Basic Input/Output System) setup utility to find the information. Entering the BIOS setup utility varies from one system to another, but it generally requires you to press a specific key during the initial test the system performs when you first turn it on. Consult your system's documentation for more information about entering the BIOS setup utility. You'll also need to look through your documentation for the location of temperature information because this location varies from one system to another, depending on the system BIOS.

In addition, a processor's operating temperature will vary depending on the system's physical design and cooling characteristics, so it's tough to provide a standard operating temperature. AMD, however, does state that maximum temperatures for a 1GHz Athlon should not exceed 90 degrees Celsius, and systems above 1GHz generally should not exceed 95 degrees Celsius (considering water boils at 100 degrees Celsius, this is extremely hot). If you have an older processor, the maximum operating temperature may be much lower.

■ **Cool Down.** If you suspect you're having heat-related issues, you can do several things to cool your system. Some of the easiest solutions won't even cost you any money.

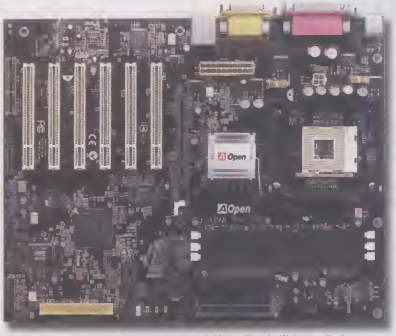
Before you begin prodding around inside your computer case, look at the environment where you store your PC. Sometimes a

simple change of scenery can do wonders. For instance, the cooler the room temperature, the better for the PC. We're not saying you need to move to a meat locker, but the temperature should be reasonably cool. If it's hot enough to make you uncomfortable, don't run your PC.

Even if the room itself is reasonably cool, the PC's location may interfere with proper cooling. Direct sunlight, for instance, can heat up your PC just as it heats up a sealed off car. Let your PC kick back in the shade and it'll be much happier. Placing your PC next to a heat source such as a heating vent or space heater is also not very wise.

Make sure your PC has plenty of personal space. Placing a PC in tight confines restricts the amount of cool air it can intake and blocks its ability to expel warm air. Try to leave a buffer zone of at least a foot around your PC to allow for proper airflow.

If you're thinking about buying a new PC, take the size of its case into account. Larger cases are more open, permitting a better airflow through the case. Small cases can become cramped, making it difficult to move air through the case.



Motherboards such as the AOpen AX4B-533 Plus utilize built-in monitoring probes to to keep tabs on the processor's temperature. This model can sound an alarm if things get too hot.

■ **Open Case Surgery.** If you can't find anything in your PC's environment that might be contributing to a heat problem, the source is probably something inside your computer case. Typically, the most common problem is a barricade of cables blocking airflow throughout the case. The flat ribbon cables that connect your hard drive, CD-ROM drive, and floppy diskette drive to the motherboard can be especially problematic.

Moving cables out of the way can dramatically improve airflow. The easiest approach to this is to use twist ties to bind the cables together. In some instances, you may be able to secure the cables to the back of the case (don't secure cables directly to the motherboard, though). Replacing the flat ribbon cables with rounded IDE (Integrated Drive Electronics) cables may also help improve airflow. The rounded cables offer less resistance, too. You can purchase these cables from a variety of online retailers.

Another common problem is dirt. Remember that a clean PC is a happy PC. Among other things, dust can act as an insulator that makes it more difficult for the air to cool system components. To keep your system dust-free, you should occasionally spray the inside of your case with a can of compressed air. Be sure to also spray around the fans, especially the power supply fans. Some cases have a filter in front of the intake fans; be sure to remove this filter and clean it on a regular basis.

If moving the cables out of the way and cleaning the inside of your PC doesn't improve the situation, take a look at your fans and heat sink. Start with the power supply fan. The power supply is the small box located in the upper-rear area of the case. In addition to supplying power to the PC's various components, the power supply also includes a fairly large exhaust fan that can remove a decent amount of warm air from within the case.

Over time, the power supply fan may begin to fail. The next time you turn on your system, hold your hand over the rear of the machine in front of the exhaust fan. If you don't feel a steady stream of warm air coming from within the PC, you may need to replace your power supply. You can purchase a new power supply from several online retailers and computer stores. Newer processors often require at least a 300-watt power supply, but older processors can probably get away with using less.

Check the other fans in a similar manner. You should feel a consistent amount of cool air blowing into the case from the intake fans mounted on the bottom front of the PC. Any extra exhaust fans mounted to the rear of the PC should be blowing a consistent amount of warm air from within the system. If you notice any fans sputtering or, worse yet, not working at all, replace them as soon as possible.

If your processor seems to be the primary problem, check the fan and heat sink mounted

Moving cables out of the way

can dramatically improve airflow.

The easiest approach to this is to use twist ties to bind the cables together.

The AOpen ACP4 includes an aluminum heat sink and 25 separate fins to help dissipate heat. The fan mounted on top has a rated speed of 4,800rpm (revolutions per minute) and a CFM (cubic feet per minutes) rating of 30CFM.

on top of your processor. A heat sink is essentially a metal chunk mounted on top of the processor that draws heat away from the processor. A decent heat sink should probably be about an inch deep. Ridges or fins on top of the heat sink increase its surface area, allowing it dissipate heat much faster. To further aid the cooling process, manufacturers usually mount a fan above the heat sink. If this fan doesn't appear to function properly, it is imperative that you replace the heat sink and fan immediately, especially if you have a newer processor. Today's processors can quickly become silicon toast if you run them for even a few seconds without a proper heat sink and fan.

Water-Cooled PCs

Air is a poor conductor of heat (as in, carrying heat away from the system), but it's good enough to keep your system comfortable. Even so, some power users need more than this and have started to use water to keep their systems cool.

Water cooling uses a system of waterblocks, pumps, reservoirs, radiators, and, of course, tubing. A CPU waterblock mounts on top of the processor in place of a heat sink. You can mount additional waterblocks on video chips and motherboard chips to cool those components. The pump pushes water through the system, carrying heat away from the waterblocks. The water cools at the radiator and the system recirculates it. The system is very similar to an automobile's cooling system.

Currently, the water-cooling system is more for hardcore enthusiasts who enjoy overclocking their processors. Because an overclocked processor runs faster than its manufacturer intended, heat becomes a major issue, and a water-cooling system is an efficient and quiet way to keep an overclocked system cool. □

■ **Processors On Ice.** Most systems have a sufficient heat sink and fan, but even if everything is working properly in this department, an upgrade can make your processor run much cooler. Retailers usually sell heat sinks and fans in pairs, so knowing what to look for can help ensure that you get the best performance possible.

Most heat sinks are made from aluminum because it's cheap, light, and easy to work with. Aluminum, however, doesn't conduct heat that well. A better material for conducting heat is copper. Many companies, including Thermaltake (http://www.thermaltake.com) and Cooler Master (http://www.coolermaster.com/home.html), manufacture copper heat sinks. Thermaltake's Volcano 7+ ($35 to $45) includes a high-speed fan affixed to an all-copper heat sink.

The downside to copper is that it's softer, making it more difficult for the manufacturer to produce. The increased manufacturing difficulties indicate why copper heat sinks are more expensive than those made of aluminum. Copper is also heavier than aluminum, which means a copper heat sink in a tower case can place extra stress on the tabs used to secure the heat sink over the processor.

In order to minimize the weight and production difficulties, some companies manufacture heat sinks with a copper base and aluminum fins. Swiftech's MCX370 ($42; http://www.swiftnets.com), for example, is available with a copper base. Even though the entire heat sink isn't copper, Swiftech still recommends that users remove the heat sink when shipping or transporting the system to minimize stress the added weight of the copper base causes.

You'll also need a high-performance fan mounted to the top of the heat sink. See the next section for more information about what to look for in a fan.

■ **Is It A Little Windy In Here?** No matter how fast you pump heat away from the processor, the enclosed computer case will continue to become hotter and hotter. The heat from the processor will combine with the heat from other components, making cooling more and more difficult. In order to keep the whole system cool, you need to remove the warm air and take in cool air.

Finding a fan seems simple enough. Faster is better, right? Unfortunately, it's not quite that simple. For one thing, faster fans (measured in rpm [revolutions per minute]) are louder fans. If you despise the background noise your PC makes, you'll want to balance your cooling needs with your PC's noise emission.

The size of the fan and the design of the fan blades play an important role in the amount of air a fan can move. Rather than looking strictly at rpm, look for a measurement known as CFM (cubic feet per minutes). This is a measurement of how much air a fan can move in respect to its size, design, and speed.

Most manufacturers make PC cases that can accommodate 80mm fans. Look for a fan with a high CFM rating and relatively low rpm measurement. You also might want to consider a variable speed fan. These fans come with a switch that lets you adjust the fan's speed as needed.

In addition to a high CFM rating, you'll also want to look for a reliable fan. Ball-bearing fans typically offer the longest life span and greatest amount of reliability. Fans with multiple ball bearings are even more reliable.

■ **Alternative Fans.** In addition to case fans and heat sinks, you can install additional fans to pinpoint a specific hotspot within the case. For instance, hard drive coolers such as Cooler Master's DCD-4002 ($29) reduce your hard drive's temperature, and slot fans such as Antec's Cyclone Blower ($14.95; http://www.antec-inc.com), remove warm air from the vicinity of PCI (Peripheral Component Interconnect) and AGP (Accelerated Graphics Port) cards.

Whether you're simply relocating your PC or doing a major cooling system overhaul, your PC will thank you for making it more comfortable by lasting long enough to become woefully obsolete. LS

by Chad Denton

Give Your PC The Boot

Create & Use Bootable Diskettes To Get Your System Back In Gear

Big machines are prone to big problems. But sometimes you can resolve those big problems with little solutions. Ignite the pilot light in a cold furnace, for instance, and a house has heat. Or connect jumper cables to a dead battery, and a stalled engine roars. This theory holds true for computers, too. Simply insert a bootable diskette into the floppy diskette drive of a malfunctioning PC, and you may be computing again in no time.

In order to take advantage of these small solutions, however, you must know what they are and how and when to use them. Most adults living in industrialized society are well aware of what pilot lights are and how jumper cables work, but far too few have a thorough understanding of bootable diskettes. We hope to change that.

■ **Boot Camp Basics.** The first thing you need to know about a bootable diskette is where it fits into a computer's startup routine. Because the details of the startup routine are too complex to discuss here, we will focus our attention on the behavior of the **BIOS** (**Basic Input/Output System**; a collection of hardwired instructions inside a computer). For all intents and purposes, the BIOS controls the startup routine. Its duties include identifying the processor, testing the hardware components to ensure that they work properly, and launching the OS (operating system). The BIOS then cedes control of the computer to the OS.

The system works splendidly as long as the BIOS is able to communicate with the **Windows drive** (the drive where Windows is installed) and load the files that control the OS. Unfortunately, forces such as file corruption and virus infection occasionally prevent this from happening. If the BIOS cannot access OS files from the Windows drive, it cannot launch the OS. And if it cannot launch the OS, the startup routine fails and the end user is left with a computer that doesn't work.

The bootable diskette offers a workaround solution to this dilemma by providing the files needed to launch the OS on a single 3.5-inch diskette. By inserting the bootable diskette in the diskette drive before **booting** (starting) the

computer, you effectively force-feed the OS files to the BIOS, thereby enabling it to launch the OS and complete the startup routine. After the OS loads completely, you then can access the contents of the Windows drive, change the settings of key system files, run basic drive maintenance utilities, and perform troubleshooting tasks that will help you resolve the problem with the drive.

(NOTE: The above explanation assumes that the BIOS is set to communicate with the diskette drive before it checks the Windows drive. If your BIOS doesn't do this, you may have to change its boot sequence settings. Contact your computer's manufacturer for details about how to set the BIOS. If you built the PC yourself, contact the motherboard manufacturer or whomever provided you with BIOS.)

Most bootable diskettes, including those used with Windows 98 Second Edition and Windows Me, are configured to launch DOS. These diskettes, which Microsoft calls Startup Disks, contain key DOS system files such as Autoexec.bat, Command.com, Config.sys, and Io.sys. DOS is the OS of choice because it has a small footprint, and therefore you can run it from a single diskette (which you can't do with Windows). As such, it serves as a temporary platform from which you can troubleshoot the Windows drive when you can't access the drive any other way.

Windows XP supports a similar type of bootable diskette, called an MS-DOS Startup Disk, though the only way you can use the MS-DOS Startup Disk is if you installed WinXP on a drive that supports the FAT (file allocation table) file system (a method for organizing data on a drive) rather than NTFS (NT file system). If the Windows drive is configured for NTFS, you can't use the MS-DOS Startup Disk because it doesn't have the capacity to communicate with that file system. In this case, you must use what WinXP refers to as a Windows Boot Disk. This bootable diskette contains the three files involved in launching WinXP: Ntldr, Ntdetect.com, and Boot.ini. These files let you start WinXP even if the files that would normally launch it are corrupt.

■ **Bootable Creations.** Whatever type of bootable diskette you need, you must go through the process of creating it before you can use it. Microsoft facilitates this process by providing a bootable diskette creation utility in each of its major OSes. All you need is a formatted 3.5-inch diskette and a few minutes of time.

Create a Startup Disk in Win98 SE or WinMe. The bootable diskette creation utility in Win98 SE and WinMe teamed up with the Add/Remove Programs utility, both of which you can access by opening the Control Panel and double-clicking the Add/Remove Programs icon. In the resulting Add/Remove Programs Properties dialog box, choose the Startup Disk tab and click the Create Disk button.

A progress indicator displays inside the dialog box as the utility begins to warm up. After a few seconds, an Insert Disk message appears

on-screen. Insert a 3.5-inch diskette in the diskette drive, click OK to close the message, and proceed with the bootable diskette creation. The rest of the process may take a minute or longer, but there's nothing to worry about as long as the progress indicator moves steadily toward the 100% completion mark. You also don't need to worry if you hear a buzzing noise coming from the computer as it writes (copies) the relevant files to the diskette.

When Windows finishes creating the bootable diskette, the progress indicator will disappear and the Add/Remove Programs Properties dialog box will look the same as it did before you clicked the Create Disk button.

Create a Boot Disk in WinXP. As mentioned earlier, WinXP lets you create both a Windows Boot Disk and an MS-DOS Startup Disk. You should create one of each if you can.

In order to create the Boot Disk, you need to insert a formatted 3.5-inch diskette in the diskette drive and the WinXP installation CD-ROM in the disc drive. When you insert the CD-ROM, the WinXP installation menu appears on-screen; close the menu by clicking the Exit button.

The first step in creating the WinXP Boot Disk is to copy a pair of files to the diskette. You can do this by opening the Start menu and clicking My Computer. Right-click the icon that represents the disc drive and select Open from the pop-up menu. In the resulting window, open the I386 folder and locate the Ntdetect.com file. Right-click it and select Copy from the pop-up menu. Use the Back button (you'll find it on the Standard Buttons toolbar at the top of the window) to navigate back to the My Computer window. From there, locate the icon representing the diskette drive, right-click it, and select Paste from the pop-up menu. Wait for the file transfer to finish and then return to the I386 folder. This time, copy the Ntldr file and paste it in the diskette drive.

Next, you'll need to create a Boot.ini file. Open the Start menu, click All Programs, Accessories, and Notepad. Type the following text in the body of a new Notepad document:

```
[boot loader]
timeout=30
Default=multi(0)disk(0)rdisk(0)partition(1)
  \windows

[operating systems]
multi(0)disk(0)rdisk(0)partition(1)\windows
  ="Windows XP"
```

This text will work, provided you have an IDE hard drive and WinXP is the only OS on your computer (a common configuration among home and small-office computer users today). However, if you have a SCSI hard drive or if you have a **dual-boot system** (a computer that runs two or more OSes), you need to make custom changes to the text. For assistance, contact the computer manufacturer (if WinXP was installed on your PC when you purchased it) or visit Microsoft Product Support Services (http://support.microsoft.com), type **Q305595** in the Search The Knowledge Base field, press ENTER, and click the How To Create A Boot Disk For An NTFS Or FAT Partition In Windows XP link.

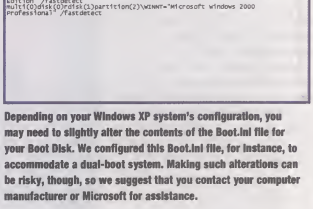
After you finish typing the text in Notepad, open the File menu and select the Save command. Select the diskette drive from the Save In drop-down menu (at the top), type **boot.ini** in the File Name field, and click the Save button.

When you boot the computer using the Boot Disk, it will start as it normally does by loading the WinXP OS. This gives you the chance to troubleshoot the computer's problems from within the Windows environment. If you can't fix the problem from within WinXP or if the Boot Disk fails, your next option is to use the MS-DOS Startup Disk.

Create an MS-DOS Startup Disk in WinXP. To create an MS-DOS Startup Disk, insert a formatted diskette in the drive, open My Computer, right-click the icon representing the diskette drive, and select Format from the pop-up menu. In the dialog box, select the Create An MS-DOS Startup Disk checkbox and click Start. When the process is complete, a message will appear on-screen. Click OK and then click the Close button. Remove the diskette from the diskette drive and label it the MS-DOS Startup Disk.

When you boot the computer using the MS-DOS Startup Disk, a command prompt will appear on-screen. You can enter basic DOS navigation commands at the prompt to view the contents of your computer and copy files from the Windows drive to a diskette drive. Remember, though, that the only way you can use the MS-DOS Startup Disk is if you installed WinXP on a drive that uses a FAT rather than NTFS file system. If your Windows drive uses NTFS, you can't use the MS-DOS Startup Disk.

Alternatives for WinXP users. There are alternatives to using an MS-DOS Startup Disk or Boot Disk in WinXP. For example, you can use the Recovery Console and your WinXP installation CD-ROM to access the OS and fix problems when your PC won't start. For more information, visit Microsoft Product Support Services at http://support.microsoft.com, type **Q307654** in the Search The Knowledge Base field, press ENTER, and click the How To Install And Use The Recovery Console In Windows XP link.



Depending on your Windows XP system's configuration, you may need to slightly alter the contents of the Boot.ini file for your Boot Disk. We configured this Boot.ini file, for instance, to accommodate a dual-boot system. Making such alterations can be risky, though, so we suggest that you contact your computer manufacturer or Microsoft for assistance.

To access an NTFS drive. You can download a third-party utility, such as NTFS Reader for DOS from NTFS.com (free; http://www.ntfs.com/products.htm) or NTFSDOS from Sysinternals (free; http://www.sysinternals.com/ntw2k/freeware/NTFSDOS.shtml) for access to an NTFS drive. See these Web sites for more details.

What To Do With A Diskette. After you create the bootable diskette, remove it from the diskette drive and label it with the name of the OS. You can store the diskette with all of your computer documentation, but make sure you protect it from temperature extremes, moisture, and magnetic forces. And don't forget where you put it. After all, you just might need it someday. LS

by Jeff Dodd

Check & Clean Your Registry

It's Time To Decontaminate The Central Database

Sure, a PC represents the cutting edge of modern consumer technology, but in many ways, it still acts like your old car. Stray pieces of outdated information clog the valves and collect among the countless working parts. As a result, system performance suffers and breakdowns become more frequent.

Most PC users rely on some version of Microsoft's Windows OS (operating system) to power their daily computing. And at the center of OSes such as Windows 98 Second Edition, Windows Me, and Windows XP is the Registry. Like every engine, the Registry is always running and bringing in and using the fuel that moves Windows forward in an orderly manner. Yet, it is the one, oft-overlooked element of OSes. Don't forget that the Registry needs conscientious maintenance and occasional valve-cleaning attention, just like the rest of your system.

■ **Registry 101.** The Registry is Windows' own database of system hardware and software. It contains an index of installed components, instructions for how these components should function, and pointers to all of the software files and hardware drivers needed to run your PC. Most of the minutiae about your system's environment—the size of Desktop icons and windows borders, which programs appear on your Start menu, which programs load into the System Tray at startup, and more—originate from specific settings somewhere in the confusing morass that is the Windows Registry. The Registry name is appropriate because newly installed software and hardware must *register* with the Windows OS through its database. The Registry actually is a set of several data files that Windows loads into memory as it boots, and then uses as guides to how all aspects of the OS should behave, look, and feel.

To get an idea about what the Registry does and what it looks like, go to the Start menu and open the Run window. In the field, type **regedit** and press ENTER to launch Windows' Registry Editor, a program that brings together the Registry data files in a unified format that makes it easier for you to modify settings. But be extremely careful because editing the Registry is not for the fainthearted, regardless of whether you are tweaking it manually or using one of the third-party cleaning programs we discuss in the "Shareware That Cleans Up" sidebar. The best and only policy you should use when making changes to the Registry is to back it up first (see our "First & Foremost: Back It Up" sidebar).

The Registry Editor divides the Registry entries into a multitiered tree of keys in the left pane. The top-level keys (Win98 SE/WinMe have six; WinXP has five) contain settings and information for your PC's major functions.

For instance, the HKEY_CLASSES_ROOT branch contains information pertaining to all of the different file types on your system and how the OS handles these files. The HKEY_LOCAL_MACHINE key holds data and settings about the hardware and software on your system. Click any of the keys in the left pane to see its corresponding values appear in the pane on the right. These values include specific settings or file locations associated with programs, hardware, or Windows features that the highlighted key controls..

To appreciate how monstrously detailed the Registry is, click the plus sign (+) next to the HKEY_LOCAL_MACHINE key to open its tree. Do the same with the Software key below it. You should see a very long list of programs, some of which you will recognize as software currently installed on your system, and others that you didn't even know you had (and some you thought you uninstalled eons ago). That is the crux of the problem with the Windows Registry: It tends to accumulate old and outdated items, pieces of programs that didn't uninstall properly, flags that programs inserted and never removed as they should have, etc. Your Registry is open and active at all times during a Windows session, with many programs pushing information in and out of it as needed. This activity is what leads to errors and bloating in the Registry, both of which can create a host of problems with your system.

By the way, you can exit the Registry Editor by opening the File menu and clicking Exit. Again, be very careful while working in the Registry Editor. Unlike most Windows programs, the Registry Editor saves your changes immediately. Therefore, any changes you make will become permanent (unless you manually change items back to their prior settings).

■ **When Good Registries Go Bad.** When something goes wrong with your system—such as when it doesn't boot properly, a device misbehaves, or Windows repeatedly delivers error messages—the Registry could be both the cause and the solution to your problem. Unfortunately, it is difficult to diagnose a hardware or software problem as a Registry glitch because very few Windows error messages point specifically to a Registry problem. Dirty Registries usually present themselves in more subtle ways. For example, you may receive persistent error messages that refer to missing DLL (dynamic-link library) or VxD (virtual device driver) files when you boot your machine.

A Registry can go bad or become corrupt if a user improperly shuts down his PC. The Registry stays in memory as you work in Windows, and programs and hardware components make frequent changes to Registry entries that Windows saves to its data files only when the PC shuts down. Interrupting the normal Windows shutdown procedure may cause the Registry to only partially save its files to the hard drive. As a result, this might cause damage to the files themselves or make the data out of sync with the rest of the Windows system configuration.

Good Registry maintenance also can resolve some hardware driver conflicts. All new hardware and software installations on your PC create Registry listings for these new additions to your system and links to any files needed to run them. Driver conflicts can occur when a user doesn't properly uninstall his outgoing hardware before installing a replacement device. Leftover elements from the old drivers may remain in the Registry and cause conflicts with the newer drivers. The can result in diminished performance or system crashes. Just remember that: Whenever crashes or error messages occur immediately after installing new hardware or software, it could indicate a driver conflict or a poor installation routine that produced conflicts among some Registry listings.

Video and audio card installations are frequent culprits of driver conflicts. Even when users uninstall old drivers from previous cards, vestiges often remain and can cause conflicts with upgraded drivers. A good indication of a driver problem is when your computer freezes or hangs as you enter a particular video mode (usually some 3D accelerated mode for gaming) or audio mode. In these cases, something from the previous card installation is conflicting with the new installation.

In other cases, a gunked-up Registry simply leads to sluggish boot times and slow overall performance because the outdated listings needlessly bloat the size of the Registry data files so that they take longer to load and save in memory. A basic Registry cleaning and compression can do wonders to speed up all PC operations.

Keep in mind that the symptoms we just described also can have other root causes. All PC problems do not lead back to the Registry. For instance, newly installed hardware may conflict with other peripherals or settings on the system motherboard, and these are problems that the Registry generally can't solve. Likewise, bad sectors on a hard drive or improperly configured hardware and software can also cause system crashes and frequent error messages. But with the right third-party tools and built-in Windows utilities, the Registry is one of the easiest parts of a system to clean, repair, and restore, so it is one of the first places a user should check before resorting to more drastic measures (such as a total Windows reinstallation).

■ **System Prep.** Although some advanced users might try manually cleaning a Registry, this is not a simple or safe procedure. Registry cleaning involves deleting outdated keys, which are listings that point to files and drivers that no longer exist on your PC. It is very easy to make a mistake and delete a vital element. That is why Registry cleaning is best left to "professionals," the types of third-party Registry cleaners and fixers that you find in many major utility suites. For example, Symantec's Norton SystemWorks ($69.95; http://www.symantec.com), Iolo Technologies' System Mechanic ($59.95; http://www.iolo.com), and V Communications' SystemSuite ($53.95; http://www.v-com.com/product/ss_ind.html; product previously sold by Ontrack) all contain one or more tools that can repair or compress the Registry.

A warning about Registry cleaning utilities: Make sure that the software is compatible with the specific version of Windows your computer uses. The Registries for Win98 SE, WinMe, and WinXP seem similar, but the actual data files working in the background are quite different, especially in the case of WinXP. Install the most recent version available for your OS.

Registry cleaning utilities search for keys to programs that no longer exist on your system or find links that are no longer valid, and then offer to eliminate these unnecessary items. This process not only reduces the overall size of the Registry, it also reduces the possibility

First & Foremost: Back It Up

The Registry is a vital organ in the biology of your computer system, so messing with it in any way, even via a name-brand cleaning utility, involves some degree of risk. The best insurance is to back up the Registry regularly, and you should certainly do this before any Registry cleaning operation. In Windows 98 Second Edition and Windows Me, the OS (operating system) automatically runs the ScanReg utility (also known as the Windows Registry Checker) every day to make a backup copy of the Registry. ScanReg keeps the last five days of backups available for restoration.

To manually make a Registry backup, open the Run window from the Start menu, type **scanregw** in the field, and press ENTER to display the Windows-based version of ScanReg (there also is a DOS version of ScanReg). A pop-up message may warn you that the OS already made a Registry backup today, so you need to click Yes if you want to make another one anyway.

To back up the Registry in Windows XP, you must use the Backup program. Open the Start menu and click All Programs, Accessories, System Tools, and Backup. After the program launches, select Backup Wizard (Advanced) and follow the prompts until you find the Only Back Up The System State Data option. The wizard will prompt you for a location on your hard drive where you want to store these files. You may want to create a new folder just for Registry backups. ■

of creating conflicts among new and old settings and listings.

Well-behaved uninstall utilities should unregister their associated software from Windows by removing their links and settings from the Registry, in addition to deleting the relevant program files from the hard drive, but this isn't always what happens. Unfortunately, few of these uninstall utilities do both jobs well.

To ensure a good Registry cleaning, there are a few preparatory steps you should take. First, uninstall what you no longer need or want on your system by using the Add/Remove Programs utility bundled with Windows.

In Win98 SE/WinMe, open the Start menu, choose Settings, and click Control Panel. Next, double-click Add/Remove Programs, locate each program you want to delete from the list, and click the Add/Remove button.

In WinXP, open the Start menu, click Control Panel, and double-click Add Or Remove Programs. Select each program you to eliminate and click the Change/Remove button. Keep track of which programs you uninstall in this manner because your next step will be to delete any physical files these programs left behind on your hard drive.

Because many uninstall routines leave some files and folders on your hard drive, you must remove them manually so that your Registry cleaning utilities do not leave links to these outmoded programs and drivers in the Registry. You'll find most software files in the Program Files folder on the same drive where Windows resides. Open Windows Explorer by right-clicking My Computer and selecting Explore from the context menu. Next, look for folders containing only the programs you deleted with the Add/Remove Programs utility. Right-click the relevant folders and click Delete from the context menu.

■ **Clean & Polish.** Now you are ready to do a real Registry cleaning. Every program will work a bit differently, but as an example, we decided to use one of the most straightforward utilities, Iolo Technologies' System Mechanic to research this process.

System Mechanic's Registry cleaning utility offers a series of options about what types of keys to look for, including everything from outdated links in the major sections of the Registry to outdated driver files (and even references to fonts that no longer exist on the system). We checked all these options and directed the program to start scanning. Most of the better Registry cleaning utilities should report their findings after a scan and give users the option to delete any or all of the keys the programs identify as outdated.

Some Registry cleaning utilities actually grade the results according to whether they consider deleting specific Registry links to be safe or potentially hazardous to the system. Heed these warnings and avoid deleting any links that seem questionable. While reviewing the cleaning utility's report of broken links, always examine any file locations for clues about which programs these links are for. If a link refers to a folder or program that you already uninstalled, then the link is probably safe for you to delete.

In our example using System Mechanic, we knew it tended to report the safest candidates for deletion, so we elected to eliminate all of the bad Registry entries it recommended.

Good cleaning utilities also back up the Registry and offer an undo mechanism for restoring the previous version of the Registry just in case something goes wrong during the cleaning process. Before executing a cleaning, always locate the undo mechanism so that you know how to revert to your previous Registry settings if necessary.

■ **Different Broom Strokes.** Registry cleaning utilities are not all created equal. Different cleaning utilities will recommend deleting different items from a Registry. In fact, you can run one Registry cleaning utility immediately after running another one, and the second cleaning utility will probably display even more obsolete links you can delete. The programs use such different techniques and criteria for scouring Registries that the results can vary greatly.

For example, the VCOM SystemSuite offers several utilities, each of which uses a different approach to Registry cleaning. The RegistryDefrag program in the suite speeds up Registry performance by eliminating any remaining empty spaces from data files and reorganizing their data structure. After we used this option on our system, we shaved about three seconds off the time WinXP ordinarily needed to boot.

Another utility in the SystemSuite, the RegistryFixer, combs through the Registry's data files to eliminate or repair broken links and references to files that are no longer on the hard drive.

And finally, SystemSuite's RegistryCleaner is actually a utility that lets you shrink your Registry by eliminating some of the many options Windows offers but most users never access, such as obscure Desktop schemes or international keyboard settings. The Registry actually includes switches for these obscure options that Windows can activate, but because the options consume space in the Registry, they only add to its complexity and the time needed to boot and shut down your computer.

Registry Restoration

If you were wise enough to back up your Registry prior to performing Registry maintenance tasks, then you can restore the Registry to a previous working state when things go wrong. In Windows 98 Second Edition and Windows Me, you can use the same ScanReg utility (also known as the Windows Registry Checker) you used to make the backup, except that you need to use the "/restore" switch to choose from a menu of the last five days of Registry backups. To do this, open the Run window from the Start menu (if you can boot your system into Windows normally or use its Safe Mode), type **scanregw /restore** in the field, and press ENTER. A menu in the next window will list the last five daily backups. Highlight the one that represents the last working state of your system, click OK, and reboot.

If you can't boot into Windows and are working from DOS, type **cd \windows\command** at the prompt and press ENTER to open the directory on your hard drive where the ScanReg utility is. At the prompt, type **scanreg /restore** and press ENTER. On-screen, you'll see a list of five possible Registry back ups to restore. Choose the most recent working version of the Registry and press ENTER.

In Windows XP, open the same Backup utility you used to create a backup (described in the "First & Foremost: Back It Up" sidebar), but this time, click the Restore Wizard from the Welcome screen. Doing this will present you with a list of previously made backups from which to choose. ■

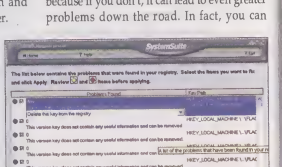
We ran SystemSuite's RegistryFixer program immediately after we ran the System Mechanic program (a Registry cleaning utility we discussed earlier). Even after a thorough cleaning by System Mechanic, RegistryFixer found hundreds of additional broken links, including references to previously installed audio cards and file directories that no longer existed. Although RegistryFixer is more thorough than System Mechanic, it also might be more dangerous if you don't use it carefully. Like some other cleaning utilities, RegistryFixer flagged the various links and settings it found as safe to delete (in green), probably safe to delete (in yellow), or possibly dangerous to delete (in red). In some cases, the items in the latter two categories are safe to delete, but they require users to manually review them first. Check each line for an identifiable reference to see whether it links to a file or program that truly is no longer there.

■ **We Can Rebuild It.** Both Win98 SE and WinMe have a Windows Registry Checker (also known as ScanReg) that you can use to back up and restore older versions of the Registry, as well as repair some basic problems that can occur. When you suspect a Registry problem, your first line of defense is to run ScanReg with the "/fix" switch. In WinMe, close all open programs, open the Run window from the Start menu, type **scanreg /fix** in the field, and press ENTER. This will reconstruct your Registry and try to repair its damaged sections. This command also compresses the Registry to eliminate unused space, which may speed up the boot process. After using this command, you must reboot your computer. The "scanreg /opt" command will compress and optimize the Registry without trying to fix anything, plus it takes less time to finish its job than the more thorough "/fix" switch and doesn't require you to reboot the computer.

If you are having trouble booting into Windows normally, you can launch ScanReg from the Run window in Safe Mode. If you can't boot into Windows at all, use a boot diskette (or your Windows installation CD-ROM if you're using WinXP) to boot into DOS. At the C> prompt, type **cd \windows\command** to open the directory where you'll find the ScanReg utility. At the prompt, type **scanreg /fix** and then try to reboot into Windows normally.

Win98 SE can boot into DOS mode without using a boot diskette. To boot into DOS mode, start the PC and press the F8 key when you see "Starting Windows" appear on-screen. From the menu of options on the next screen, choose Command Line, which displays the DOS prompt. Use the same procedure outlined in the previous paragraph to run ScanReg. Type **cd \windows\command**, and at the next prompt, type **scanreg /fix**. After the utility finishes, try to reboot your computer into Windows normally.

■ **Good Registry Hygiene.** There are some good rules to follow to prevent Registry problems altogether. Most importantly, avoid shutting down your PC improperly because this is one of the surest ways to damage a Registry. If your PC has trouble shutting down normally, try to diagnose and fix this problem, because if you don't, it can lead to even greater problems down the road. In fact, you can resolve some shutdown problems by effectively cleaning your Registry, so start there.



Some Registry cleaning utilities, such as SystemSuite's RegistryFixer, will indicate how safe or unsafe it is to delete specific outdated items from the Registry.

Next, always uninstall programs and hardware devices with their own uninstall utilities or the Windows Add/Remove Programs utility to ensure that they remove *most* of their associated files and Registry components. When upgrading to a new peripheral, such as a printer, mouse, or audio card, always fully uninstall the old device and its driver(s) before installing the new device. Even when upgrading the drivers to existing hardware, especially graphics cards and audio cards, it is best to uninstall the old drivers first. This helps clean the Registry of links and listings that could conflict with the new drivers.

In the end, it is a fact of life that while running Windows, its Registry will likely bloat over time. These data files are so active during each Windows session, with numerous programs writing to them and leaving several useless settings behind, that it is inevitable the Registry will become oversized eventually. Then, because many users are unable to find out what is really ailing their slow or buggy PC, they decide to reformat their hard drives and reinstall Windows to start fresh. In reality, good Registry hygiene might prevent such problems. Or, if the Registry is already suffering from bloating, a decent Registry cleaning utility might be a much easier way to fix it. LS

by Steve Smith

Shareware That Cleans Up

Numerous shareware and freeware utilities are available to clean and maintain your Registry. Here are a few utilities that we think stand out from the rest.

Reg Organizer from Chemtable Software ($25 for registered version; http://www.chemtable.com)—In addition to cleaning the Registry, this utility permits sophisticated editing and the monitoring of changes to specific keys. It also presents the Registry in a format that's organized around functions (file associations, installed programs, etc.) rather than the standard tree structure found in Windows' Registry Editor.

Registry First Aid from Rose City Software ($21 for registered version; http://rosecitysoftware.com)—Registry First Aid not only finds and deletes orphaned files and folders, it also repairs broken links.

Resplendent Registrar from Resplendence ($44.95 to register after a 30-day trial, http://www.resplendence.com)—This tool is more of an advanced editor and Registry monitor than an automated cleaning utility. Even so, it tracks which programs change the Registry and lets you perform search and replace functions, in addition to creating backups, using remote editing, and completing defragmentation.

Enhance Your Memory

Experience A Massive Performance Boost For A Mere Pittance

Computer running slowly? Most people curse their CPUs when programs run like molasses or the system hiccups, but in most cases, you can get a better performance boost by bumping up the amount of memory in your computer than rather investing in a faster CPU. Adding memory is fast, easy, and incredibly cheap (depending on the type of computer you have), making it the most cost-effective computer upgrade possible.

Some budget computers come with memory chips fused permanently to the motherboards, making upgrades impossible. Fortunately for most of us, it is easy to remove or rearrange the memory chips that came with the computer; typically, one or more slots is available to accommodate an upgrade without letting your existing memory go to waste. The installation itself is simple, so the biggest hurdle to jump when upgrading memory is to determine the type of RAM your computer uses.

■ **Select Your RAM.** Choosing the type of RAM to add to a system is quite a chore these days, as various CPU and motherboard combinations allow for more types of memory than ever before. The fact that these different types of memory all run at different speeds just compounds the options, and your motherboard will only work with one type of memory at one or more available speeds. Something else to consider is that you must add some types of memory in pairs, so make sure you have enough open slots to accommodate the upgrade.

Look at the documentation that came with your computer or contact your computer's manufacturer to decide what type of RAM is best to add to your system. Another option is to use one of the online tools available at many memory manufacturers' Web sites that let you enter the model number or type of computer you have to generate a list of compatible memory chips.

SDRAM. Most computers manufactured in the last five years or so use SDRAM (synchronous dynamic RAM). These chips come in four different speed ratings, including PC66, PC100, PC133, and PC150. The number represents the speed at which the memory operates; therefore, PC100 communicates with the motherboard at 100MHz. Although you can use any type of chip with any motherboard that supports SDRAM, the memory will never run faster than its rated speed or faster than the motherboard's rated memory speed. For example, a PC100 memory chip runs at 100MHz in a PC133 slot, at 100MHz in a PC100 slot, and at 66MHz in a PC66 slot. It is possible to mix different types of memory, but all of the memory runs at the speed of the slowest installed chip, so it is best to match speeds if possible. You also don't need to install SDRAM in pairs.

DDR SDRAM. DDR SDRAM (double-data-rate SDRAM) is what its name implies: a type of SDRAM that works twice as fast as standard SDRAM. The particulars are not important, but what is important is that DDR SDRAM is found in many modern systems with AMD processors and some recent systems equipped with Pentium 4 processors. The memory comes in several varieties, including PC1600, PC2100, PC2400, PC2700, PC3000, PC3200, and PC3500. Here, marketing determines the numbers rather than the actual MHz speed rating of the chip, but the higher numbers do correspond to higher speeds. So, just try to buy the fastest chips with matching specifications that are compatible with your motherboard.

RDRAM. RDRAM (Rambus DRAM) is a newer memory technology Rambus developed, and many computers equipped with Pentium 4 processors now use RDRAM. It, too, comes in several speeds, including PC600, PC700, PC800, PC1066, and PC1200. We recommend that you buy the best possible RDRAM your system supports or buy memory that matches the RDRAM already installed in your system.

You can't leave any RDRAM memory slots open because signals from the motherboard must travel through each slot to complete the circuit. Any slots without memory chips must have a special C-RIMM (continuity

RIMM) installed, which has no memory chips but does have contacts at the bottom that pass signals to the next chip in the RDRAM banks. You also must install RDRAM modules in matched pairs that are equal in every way. Because of this requirement, you can't buy a single chip and use it to replace a C-RIMM already installed in your system.

Legacy RAM. Very old computers don't use any of the aforementioned types of memory. Although the prices of most computer components fall with time, prices for memory chips only decrease until a new generation of memory appears, and then the prices for the older memory chips gradually rise as their supply dwindles. Older EDO (extended data output) and FPM (fast page mode) chips are much more expensive than modern memory chips and don't even come close to the memory capacity of the newer components. Upgrading the RAM in a PC that uses EDO or FPM memory will increase the overall performance of the system, but you must install the chips in matched pairs and contact the memory manufacturer to make sure the RAM will work with your system. Some chips work with Pentium processors, for example, but not 486 processors.

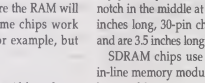
When you install a SDRAM (synchronous dynamic RAM) chip, you need to line up the two notches along the bottom of the chip with the corresponding plastic tabs in the memory slot.

■ **Other Considerations.** Although we have covered the basics of RAM, there are many other aspects to consider, regardless of the type of memory your computer uses. ECC (Error-Correcting Code) memory is designed for use in servers, where stability takes precedence over speed. Consumers, however, are better off sticking with faster, cheaper non-ECC memory. Parity vs. nonparity memory is another thing to worry about, and most systems use nonparify RAM. Parity memory, used to create ECC chips, utilizes special technology that lets the memory unit check for data storage errors. Nonparity memory doesn't offer any error-checking ability, but it runs faster than parity memory and is generally much cheaper. Check your computer's documentation to determine the type you need.

Most memory chips have internal timing information provided, measured in nanoseconds. Lower timing ratings are better, but not crucial, and it is more important to try to match the timings of all your memory chips than to focus on buying components with the fastest ratings. Sometimes manufacturers also list **CAS (column address strobe) latency**, which is a measure of how quickly the memory responds to commands. Lower numbers are better (faster), but nothing for the average user to worry about.

The type of memory slots found on your motherboard also play a crucial role in determining what type of memory you can install. Older motherboards that use FPM or EDO memory have either 30-pin or 72-pin SIMMs (single in-line memory modules). A 30-pin SIMM won't fit in a 72-pin slot (and vice versa), so be careful what type of legacy memory you buy. Whereas 72-pin chips have a notch in the middle at the bottom and are 4.25 inches long, 30-pin chips don't have a notch and are 3.5 inches long.

SDRAM chips use 168-pin DIMMs (dual in-line memory modules) that are 5.25 inches long and have two notches at the bottom; by comparison, 184-pin DDR SDRAM chips are the same length but have only one notch at the bottom. In addition, 184-pin RDRAM chips use RIMMs (a Rambus-trademarked word, not an acronym) and have two notches at the bottom; spaced close together and near the center. Most RDRAM chips also have aluminum shells to encase them and help distribute and disperse heat.



Most RDRAM (Rambus DRAM) modules have aluminum shells to protect fragile circuitry and prevent overheating.

■ **Bring Your Purchase To The Counter.** Once you have determined the type of RAM you want to buy for your computer, the next step is to figure out where to buy it. This isn't as obvious as it seems because prices and return options vary dramatically, and each store has its own pros and cons. For guaranteed compatibility, purchase a RAM upgrade directly from the company that manufactured your computer. This option can be expensive, though. Computer manufacturers typically charge two to three times as much as online stores that sell memory.

Local retail stores and computer shops are your other options, but they also tend to charge more than online stores and rarely stock more than a few brands of memory. Plus, these stores are more likely to stock generic memory instead of the best parts from companies such as Crucial Technology (http://www.crucial.com), Kingston Technology (http://www.kingston.com), and Mushkin (http://www.mushkin.com). Computer builders generally regard these companies as the best memory manufacturers in the business. On the positive side, returning defective or excess memory is usually easy. Regardless, you need to carefully check the store's return policy because defective memory chips aren't generally repairable.

One thing to watch out for is OEM (original equipment manufacturer) memory. This memory costs less than boxed retail memory because it's for system manufacturers such as Gateway and Compaq. Although you save a few bucks buying OEM components, you generally lose the manufacturer's warranty, technical support, and installation instructions that come with retail components.

■ **Add RAM, Step By Step.** Now that you have your RAM and are ready to install it, you need to properly prepare your computer and its surrounding area to avoid trouble. Static electricity is your biggest enemy, so leave the chips in their antistatic bags until you are ready to install them, and make sure you discharge all static electricity from your body before you start the installation. You can do this by touching any metal portion on the inner frame of your computer case, but make sure you leave the computer plugged in (and turned off) before doing so because the power cord provides the ground wire for the case. You might want to spend $5 to $10 on a special antistatic wrist strap to keep you grounded throughout the entire installation.

The next step is to remove the outer shell of your computer case and then move or remove any cables or internal components blocking your access to the memory slots. Mark any cables you detach so you know

where they go when you're ready to reassemble everything.

Now for the easy part: installing the memory chips. The first rule is to never touch the metal contacts on the bottom of the chip because the combination of oil from your fingers and electricity running through the chip may corrode the contacts. This causes errors and may even prevent the chip from working at all. In addition, always make sure any notches along the bottom of the chip line up with the corresponding plastic tabs in the memory slot. The notches keep you from installing the chips upside down. Finally, never rock the chips back and forth in the slot or use too much force to secure them to the motherboard. This can damage their delicate metal contacts, and any excess force might crack the motherboard.

When installing legacy RAM such as a 72-pin SIMM, insert the memory chip into the slot at an angle and press upright until it snaps into place. Do not push it straight down into the slot or else the holding clips won't engage. If you need to unseat an old chip to make room for the new one, simultaneously open the clips at both ends of the slot, tilt the chip down at an angle, and gently remove it.

DIMM chips, such as SDRAM and DDR SDRAM memory modules, are different. With these chips, you need to first press down on the clip handles on both sides of the slot until they are completely open. This ejects a chip already in the slot or prepares an empty slot for the insertion of a new chip. Next, gently place the chip you're installing into the slot so it is standing vertically, and then press down firmly on both ends of the memory chip until the clips lock into place. You might need to grab the handles and close them manually to properly seat the chip; make sure both ends are secure before you boot the computer because it is possible to mistakenly clamp down only one end while not making contact with the other.

A RDRAM RIMM installation works similarly. Open the tabs on either side of the slot to eject an existing chip and to prepare the slot for a new chip. Gently put the memory chip directly into the slot so it is standing vertically, press down firmly on both ends of the chip, and make sure the clamps on both ends lock completely as you seat the chip. If you need to install any C-RIMMs, repeat this procedure for the empty memory slots.

■ **Test The Installation.** Testing the new memory is actually harder than installing it simply because bad memory chips cause all sorts of errors that are difficult to pinpoint. After you install the extra memory in your computer, turn on the monitor and watch it carefully while you boot the system. Many computers display a memory check (or some other indicator) on-screen to display how much memory the system has; these numbers should match the amount of total memory installed in your system. It also is a good idea to access the computer's BIOS (Basic Input/Output System) and see the amount of installed memory it now reports. The process for doing this is in the documentation that came with your computer. (For more information about the BIOS, see "The BIOS' Role During Startup" on page 21.)

If all the information appears correct on the boot screen and in the BIOS, let Windows load and watch for errors. Everything should go smoothly, but if it doesn't, you may need to take the new memory chips out, put your old ones back in, and see if the same error appears again. If it doesn't, there is a possibility that you purchased faulty memory chips, so you should take them back to the store (or to a friend's house if you purchased the chips online) to test them on a different computer. Local computer shops might also provide a memory testing service, so consider this type of option before you return the potentially bad chips.

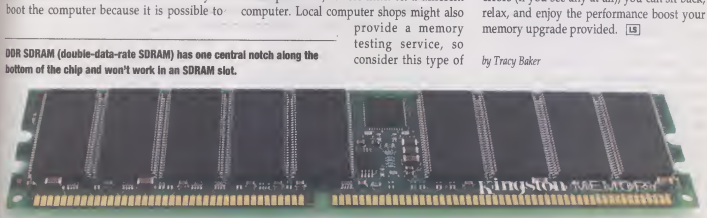
In most cases, the computer boots normally after you finish the installation, and Windows loads faster than it did previously because of the extra memory you installed. Right-click My Computer and select Properties (WinXP users might need to click Start, right-click My Computer, and select Properties). Choose the General tab to see the amount of memory Windows now reports (usually listed toward the bottom). If the amount listed doesn't match the amount of memory installed in your computer, it might be because of bad memory, but frequently it's because you didn't push one (or more) of the memory chips in all the way so it isn't (they aren't) making proper contact with the motherboard. Turn off the computer, look at the memory chips (again, taking all the proper precautions before opening the case), and make sure each chip firmly locks into place. Sometimes a chip that looks secure becomes loose if the computer case moves at all after the installation.

If the amount of memory Windows reports is correct, the next step is to run as many applications as possible to see if doing so generates any unusual errors. Memory is a very fickle thing, and it sometimes runs fine for hours before abruptly crashing due to an improper installation or an error in the chip design itself. Sometimes these errors are minor and only cause a single program to crash; at other times, these errors can cause a computer to freeze completely. In either case, all memory errors should be limited to flaws within your software and not be because of faulty memory chips themselves, so that's why it's imperative that you replace bad memory chips.

As soon as you no longer see any unusual errors (if you see any at all), you can sit back, relax, and enjoy the performance boost your memory upgrade provided. LS

by Tracy Baker

DDR SDRAM (double-data-rate SDRAM) has one central notch along the bottom of the chip and won't work in an SDRAM slot.



Stay Current With Windows Update

The Easiest Way To Update Selected Operating Systems, Applications & Drivers

It's a fact of computing life that developers constantly update software. They create features, security patches, and other enhancements even after a software release. As a result, having the latest version number of a program doesn't guarantee that you have the most recent version. That's why you need to regularly add updates to your programs to make sure you have the most recent software adaptation of each. The good news is that these updates are easy to download and install, thanks to the Internet. The bad news is that it can be hard to find some updates.

Users of Microsoft products, however, can easily stay up-to-date by taking advantage of Windows Update. Microsoft introduced the Windows Update feature with Windows 98 and has made it available for each major version of Windows released since then. Windows Update lets you find updates to help keep your Windows OS (operating system), designated hardware drivers, and selected applications running as smoothly as possible.

■ **How Windows Update Works.** Although Windows Update is available to users of Win98 Second Edition, Windows Me, and Windows XP, it isn't exactly a software component. Rather, it's a Web site that Microsoft administers to share files related to Microsoft OSes and software, as well as third-party software and hardware. When you connect to the Windows Update site, it scans your system and offers a selection of updates that apply to the software and hardware installed on your system. For instance, you may learn that your printer driver is out of date and receive an offer to download the most current one.

These updates fall into several categories. The most important are the security-related updates and enhancements for OSes. If you don't install such updates, which Microsoft refers to as critical updates, your computer and software applications could fail, or, at best, run poorly.

Another category of updates includes **drivers**, programs that let your OS control and instruct devices attached to your system. Printer, scanner, and sound card drivers fall into this category.

In addition, Windows Update will present you with files that can enhance your computing experience but aren't critical to the way in which your system runs. For example, Microsoft bundled Windows Movie Maker 1.1 with the first releases of WinXP Home Edition and WinXP Professional. Since then, Microsoft released version 1.2.1, and WinXP users who run Windows Update now have the option to upgrade to the newest Windows Movie Maker version.

■ **A Little FYI.** Before you open the Windows Update site, we recommend that you keep a few things in mind. One, because Windows Update is a Web site, your Internet connection must be up and running before you can access the files. Two, you must use a registered copy of Windows before Windows Update lets you download anything. (If you didn't register your OS, you'll only be able to browse the Windows Update site.) And three, because of the technology underlying Windows Update, you'll likely need to have ActiveX enabled on your computer. If, during the process of using Windows Update, you receive a prompt to download ActiveX components, respond with a "yes."

There are a couple of ways to access Windows Update aside from using automatic processes (which we'll cover later in this article). One method is to visit the Windows Update site by typing **http://windowsupdate.microsoft.com** in Internet Explorer's Address field. But instead of typing its **URL** (**u**niform **r**esource **l**ocator; Web address), it's much easier to just find its icon on your Start menu.

If you use Win98 SE or WinMe, open your Start menu and click the Windows Update shortcut in the upper portion of the main Start menu. If you don't see the shortcut there, click Settings and click the Windows Update icon from that submenu. If you use WinXP, click Start, All Programs, and Windows Update. You should see its icon in the large alphabetical list of programs or the upper portion of the All Programs submenu.

No matter how you access Windows Update, you'll end up at the Windows Update Web site. Specific details of the site and how Windows Update appears in your browser window may vary from system to system, but the basic processes we cover here should remain constant.

On the left side of Windows Update's start page, you'll see a number of navigational features that take you to the various components of Windows Update, including general information about your system's installation history. On the right side of the page, you'll see some text, a link that lets you scan for updates, and some information about new features (maybe, depending on your system).

■ **Review Suggested Updates.** From the right side of the Windows Update start page,

click the Scan For Updates link (or something similar) and wait a few moments while Windows scans your hard drive and matches it against the available update files. In a few seconds, a notice will appear on-screen to tell you which files Windows Update found most appropriate for your system and which ones it recommends you download.

Next, look in the left pane for a Pick Updates To Install heading (or something similar), where you'll see a list of available updates divided into three categories: Critical Updates And Service Packs, Windows, and Driver Updates. Select one of the categories, and a list of all the updates available for your system in that category will appear in the right pane.

For instance, when we accessed the Windows Update site via a WinXP computer, the Windows category displayed 18 updates for our system. These updates addressed a variety of issues, including CD burning, keyboard layout, and the Files And Settings Transfer Wizard.

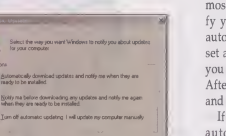
Click the desired category and take a moment to scroll through the list of files Windows Update displays for your system. Each listing contains the file name, file size, download time, and a brief description. When you find an update you want to download, click the Read More link at the end of its description to view information such as system requirements, overall purpose, and possible side effects.

For example, when we clicked the Read More link for Windows Movie Maker 1.2.1, we discovered a trade-off. Microsoft noted that the quality of the resulting digital media files would improve, but that recording time and hard drive usage might increase.

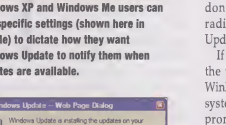
■ **Download & Install.** After you complete your analysis on each available update and decide which ones you want to install—and we highly recommend that you install all appropriate Critical Updates and Service Packs—click the Add button next to each desired update and then click the Review And Install Updates link at the top of the page. Windows Update will present you with a list of your chosen items, including the file size and estimated download time. Click the Install Now button. When you see a licensing agreement appear on-screen, read it and click Accept to start the download process. You can keep track of the download and installation processes by watching the progress bars in the handy dialog box that appears on-screen.

After Windows Update finishes downloading and installing the files, a list of installed files will appear in the right pane. Windows Update might also prompt you to restart your computer to complete the installation process. Close any open programs and reboot.

■ **Notification Notes.** Although the process for running Windows Update is essentially the same for Win98 SE, WinMe, and WinXP, there is one major difference: notification. Although Windows Update is a wonderful tool, it works even better when you automatically know when updates are available for your system. Depending on your OS, you may be able to set up an automated process to help you with this.


Select the way you want Windows to notify you about updates for your computer
Options:
Automatically download updates and notify me when they are ready to be installed
Notify me before downloading any updates and notify me again when they are ready to be installed
Turn off automatic updating. I will update my computer manually
Previous Updates:
Updates that have been previously rejected are marked as hidden. You can unhide these updates to install them when applicable.
Restore Hidden Items
OK
Cancel

Windows XP and Windows Me users can use specific settings (shown here in WinMe) to dictate how they want Windows Update to notify them when updates are available.


Windows Update - Web Page Dialog
Windows Update is installing the updates on your computer. Please wait.
Windows Movie Maker 1.2.1
Download progress
11.3 MB/11.3 MB
Download time remaining
0 minutes
Install progress

You can view Windows Update's status as it downloads and installs updates and patches on your system.

If you use WinXP, you can take advantage of an automated process by initially setting up your system to search for updates so Windows Update will notify you whenever critical updates are available. To set up this automated process, click Start, Control Panel, and System (in the Performance And Maintenance category). When the System Properties dialog box appears, choose the Automatic Updates tab, select the Keep My Computer Up To Date checkbox (checkbox not available on some WinXP systems), and select any of the three radio buttons below.

The settings next to these radio buttons vary from system to system, so select the one most appropriate for you. Some settings notify you when updates are available, some automatically download updates and let you set a schedule for installation, and others let you turn off the Automatic Updating feature. After you select a radio button, click Apply and close the dialog box.

If you use WinMe, you also can set up an automated process to notify you when updates are available, but the procedure is a little different. Click Start, Settings, Control Panel, and select the Automatic Updates icon. Choose the desired setting by selecting the appropriate radio button (and if you don't want automatic updates, select the radio button next to Turn Off Automatic Updating). Click OK.

If you use Win98 SE, your OS doesn't have the type of automated process available in WinXP and WinMe. But, depending on your system, you might already receive periodic prompts from Microsoft when it strongly recommends that you download and install specific critical updates. If you want some sort of regular reminder to visit the Windows Update site and manually install updates, you can make Windows Update the home page that your Web browser opens whenever you launch it.

To keep your system operating as smoothly as possible, we recommend that you set up an automated notification process for Windows Update or visit the Web site on a regular basis (preferably every couple of weeks). One of the best ways to ensure your system is in optimum condition is to download and install any security fixes, new features, or other enhancements available for your OS, applications, or device drivers. Fortunately, with Windows Update, you can easily track update files and have them up and running on your system in no time. LS

by Heidi V. Anderson

Microsoft Office Mishaps

Combat & Overcome Its Bad Habits

It's enough to give you a splitting headache. Even though Microsoft Office includes some of the best applications around, it also has enough idiosyncrasies and inconsistencies to make you want to run to your pharmacy for migraine medication.

Yes, Office does have some frustrating aspects, but its power and usefulness generally outweigh its problems. And although Office can make computing bumpy at times, knowing how to effectively troubleshoot its glitches isn't too tough to master. So buckle up, and we'll take through the most troublesome of these glitches to make sure your next computing session with Office's applications runs much smoother.

Interface Dilemmas. Overall, each application bundled in the Office suite, including Word, Excel, PowerPoint, and Outlook, has a user-friendly interface. Most of the toolbars, menus, and other screen items are intuitive and relatively easy to figure out, but there are other things that aren't quite so obvious.

For example, you may find yourself spending a long time hunting for a command or button you need. If this happens, check to see if the toolbar with the button you want is even displaying on-screen. Here's how: Open the View menu and select Toolbars to see a list of what's available. Make sure a check mark appears next the toolbar you want to view. An even quicker way to access this list is to right-click any visible toolbar in your application window and then choose a toolbar from the shortcut menu that displays.

If you see a check mark next to a toolbar in the shortcut menu but can't find it on-screen, perhaps it isn't in its default location. Maybe you previously dragged and dropped it too close to another toolbar, making it difficult to see all the buttons on each. Or maybe it used to be a floating toolbar that you dragged to the outside edge of the application window, turning it into a hard-to-see docked toolbar. In either case, the fix is the same: Rest your mouse pointer over a toolbar's vertical move bar (represented by a vertical line that displays to the left or on top of a toolbar) until a four-headed arrow displays, and then drag the toolbar to where you want it to appear in the application's interface.

Depending on the size of your monitor, you also might notice that you can't see all the buttons you need because two toolbars appear condensed in a single row. For example, in Word, the Standard and Formatting toolbars may display in one row. To fix this, right-click any visible toolbar and choose Customize from the shortcut menu. In the Customize dialog box, choose the Options tab and either select the checkbox next to Show Standard And Formatting Toolbars On Two Rows or deselect the checkbox next to Standard And Formatting Toolbars Share One Row, depending on which version of Office you have. When you finish, click Close.

Another foible? Screen elements that normally display don't show up the next time you open an application window. For example, one day you might notice that the Status bar or scrollbars aren't visible because the application inadvertently disabled them. The fix is basically the same in Word, PowerPoint, and Excel: Click Tools, Options, and the View tab to see which objects have check marks and are currently active. If you don't see a check mark next to an object that you want to appear on-screen, select it. If you're not sure what a particular object does, click the Help button (which has a question mark on it) in the upper-right corner of the dialog box, and then click the object name to display a ScreenTip about it.

Finally, you may notice that some of the commands on a submenu don't display when you initially choose the associated menu command. That's because, by default, Office only shows the menu options that it feels most users need and/or those that you've recently accessed. To display a full menu, double-click the menu names (such as File or Edit) from the Menu bar. If you'd like to display the full menus all the time, you need to change the underlying settings. In Office XP, choose Tools, Customize, and the Options tab. Select the checkbox next to Always Show Full Menus and click Close. This command, by the way, universally affects all Office XP applications, so you won't have to individually select this option in each application.

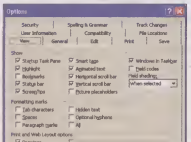
Installation Interruptions. Don't you hate it when you're cruising along, working on a project, and Office suddenly flashes a message window that says, "This feature is not currently installed. Would you like to install it now?"

The reason why this happens is because Office doesn't actually install some of its

No one likes to think about them, but vulnerabilities in security are real, and crackers (hackers with criminal or malicious intent) love to exploit them.

features on your computer until you try to use them. That way, your hard drive doesn't become cluttered with things you'll never use. Instead, when you demonstrate that you *do* want to use an optional extra feature, Office then prompts you to install it. Although Microsoft's intent in this case is understandable, some people don't want to interrupt a project just to look for their Office installation CD-ROMs and install a particular feature.

With this in mind, you have a couple of choices: one, you can continue to install Office features on an as-needed basis; or two, you can install all of Office's extra features in one sitting. If you choose the first option, you'll just need to keep the Office installation CD-ROMs handy so you can use them whenever Office prompts you to do so. Alternately, if you'd rather install all of the optional features at once, you can certainly do so if you have enough hard drive space.



To easily find options while using Office applications, change the settings found in the Options dialog box to only display the elements you want.

In Windows XP, click Add Or Remove Programs from the Control Panel (found on the Start menu), select Microsoft Office in the Add Or Remove Programs dialog box, and then click the Change button. When the Microsoft Office Setup Wizard launches, click the Add Or Remove Features button, and then click Next. On the Features To Install list, you'll see all the programs included in Office. If necessary, compress the list by clicking the minus sign (-) next to Microsoft Office. Then, open the drop-down menu next to Microsoft Office and choose Run All From My Computer. Click the Update button. As soon as the process is complete, you should have all the Office features you'll ever need at your fingertips.

■ **Call Repair Personnel.** If any Office application files become corrupt, you can use the suite's built-in fix and direct Office to automatically repair itself. This capability helps you get up and running again by placing the applications in the condition they were in when you first installed Office.

For example, this fix will take care of problems concerning missing files and Registry settings. Granted, by using this tool, you'll also find that some of your customized settings (such as updated security settings) will revert back to their defaults. However, this seems like a small sacrifice to pay for being able to get back on task relatively quickly.

To repair an Office application that's not running well, choose Detect And Repair from that application's Help menu. Click Start in the Detect And Repair dialog box and then follow the on-screen directions.

■ **Patch Them Up.** No one likes to think about them, but vulnerabilities in security are real, and **crackers** (hackers with criminal or malicious intent) love to exploit them. Unfortunately, Office XP includes a couple of particularly serious security holes, which can open the door for a cracker to take over your computer system.

The first problem concerns Outlook. A cracker can embed **active content** (material that changes on-screen according to specific time intervals or user interaction) in an email message, which is then set off as users forward or reply to the message. Sometimes code is also present that forces the victim to visit a Web site developed by the cracker. This can then expose the victim's computer to dangerous code. Scared? You should be. Even so, there are some things you can do to protect your system.

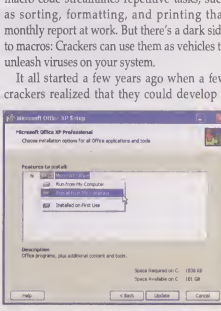
Your first step (and an important one) is to download and install Office Service Pack 2 from Microsoft's Web site (http://www.microsoft.com/downloads). This patches up the most glaring of the currently known security holes.

To be even more secure, you also can uninstall Office Web Components (sometimes referred to as OWC). Office Web Components help you publish spreadsheets, databases, and charts to the Web, but they also are associated with a security problem in Office. Consequently, if you don't need this feature, consider ditching it for safety's sake.

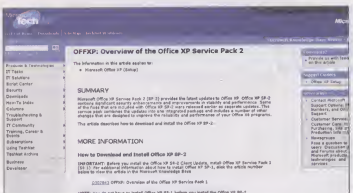
To do this, open the Control Panel (from the Start menu), double-click Add Or Remove Programs, and select Microsoft Office from the list. Choose Add Or Remove Features and click Next. From the list of installed features, click the plus sign (+) next to Office Shared Features to expand the list. Open the Office XP Web Components drop-down menu and choose Not Available. Click the Update button to remove these components from your system.

Office macros are another security issue that can give you nightmares if you're not aware of how to deal with them. Normally, macros run helpful code within programs, and executing macro code streamlines repetitive tasks, such as sorting, formatting, and printing that monthly report at work. But there's a dark side to macros: Crackers can use them as vehicles to unleash viruses on your system.

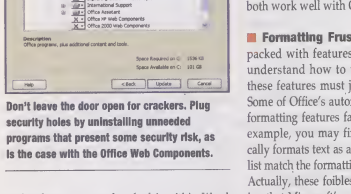
It all started a few years ago when a few crackers realized that they could develop a



Even though installing all of Office's features at once will consume a lot of hard drive space, you might consider this as an option if you don't want Office to prompt you to install optional features on an as-needed basis.



Avoid problems by promptly downloading service packs, such as Microsoft's Office Service Pack 2.



Don't leave the door open for crackers. Plug security holes by uninstalling unneeded programs that present some security risk, as is the case with the Office Web Components.

malevolent macro and embed it within Word or Excel files. So, if you happened to be an unlucky victim that unsuspectingly opened an infected document, the macro would execute—and boom!—you had problems. The extent of the difficulties depended on the actual code, but it could include such drastic problems as losing all of your data files or programs.

To prevent malicious macros from running loose on your system, raise Office's macro security level. The security level you choose is set for all Office programs, so you only have to set it once. In Excel, Word, or PowerPoint, click Options from the Tools menu. Choose the Security tab, click the Macro Security button, and choose one of three levels. The High level prevents any macros from executing, but it also may limit other things you want to do within Office applications (such as running useful macros). On the other end of the spectrum, choosing the Low level is potentially dangerous because it lets all macros execute without your permission. The Medium level strikes a good balance between functionality and safety because it gives you a choice of whether to run macros.

Of course, you should *always* run regular (as in daily) backups of critical data and keep anti-virus software activated on your system. Just make sure the antivirus software doesn't have compatibility problems with Office XP or your OS (operating system). Symantec's Norton AntiVirus ($49.95; http://www.symantec.com) and McAfee's VirusScan ($59.99; http://www.mcafee.com) both work well with Office XP.

■ **Formatting Frustrations.** Office is jam-packed with features that are helpful if you understand how to use them; if you don't, these features must just lead to frustrations. Some of Office's automatic text correction and formatting features fall into this category. For example, you may find that Word automatically formats text as a title or makes items in a list match the formatting of the first listed item. Actually, these foibles are "by design," meaning that Microsoft's software developers had a purpose behind the creation of these features and hoped users would find them useful.

For example, Word applies preset styles to whatever it determines is a heading, such as a title. To see this feature in action, open a new Word document file, type a few words of sample text on a blank line, and then press ENTER twice. If the default settings are in place, Word will format the text as a title, using Arial, 16-point, bold font. This is great if that's what you had in mind, but it's not so great if you didn't want this text to appear in the default format.

To untangle the mystery of what Office automatically formats, you can examine the AutoFormat As You Type features and then decide whether you want to use them. To do this, open the Tools menu, click AutoCorrect Options (AutoCorrect in Office 2000), choose the AutoFormat As You Type tab, and review the formatting options listed there. To find out what each option does, click the Help button in the upper-right corner of the dialog box and then click the option. You can toggle between the active and inactive modes for each option by selecting and deselecting the appropriate checkbox.

For example, to turn off automatic formatting for titles in Word 2002 (part of Office XP), deselect the Built-In Heading Styles checkbox. The AutoFormat As You Type features vary a bit among Office applications, so take some time to open each application and set them according to your preferences.

AutoFormat As You Type has a close relative: AutoCorrect. By default, AutoCorrect corrects common typos and misspellings. It also converts some text strings into symbols. For example, if you type **(c)** in a document, Word automatically converts it into a copyright symbol. Although this is useful to some people, other people become annoyed at Office's insistence at changing text into smiley faces and other characters.

You have two fixes for this situation: one, if you occasionally use the entries AutoCorrect presents, you can use a keyboard shortcut to quickly revert to your original text on an as-needed basis; or two, you can permanently remove the entry from the AutoCorrect list.

As you're typing, if AutoCorrect changes your text into what it thinks is correct, you can change the text back to what you originally typed, provided you do so immediately. To do this, just press CTRL-Z on your keyboard (or click the Undo button) as soon as you see AutoCorrect change your text. But using this quick fix only works on an as-needed basis, so if you want a more permanent solution, open the Tools menu and click AutoCorrect Options. On the AutoCorrect tab, scroll through the Replace Text As You Type list until you find the entry you want. Select the entry and click the Delete button. Now, even though you deleted the entry from the list, AutoCorrect places it in the Replace and With fields, presumably so that you can add the entry back to the list by clicking the Add button. To remove the entry from the list for good, all you have to do now is close the AutoCorrect dialog box.

■ **File Recovery Foibles.** Think back: How many times during your computing career have you been working on a document, only to experience a power outage or computer crash that wipes out hours of work? Yes, we all know we should save our files often, but that advice seems to disappear

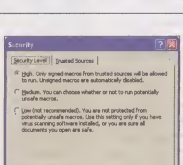
AutoRecover works great most of the time, and it has certainly saved users from countless hours of work, but you have to know how to use it properly.

from our minds when we're busy working on an important project.

Fortunately, Office includes a great feature, AutoRecover, which prevents users from completely losing documents in situations like these. AutoRecover works by redisplaying the files that were open at the time of the outage or crash as icons in the Document Recovery task pane. Office displays "[Original]" next to a file's name to indicate that the file wasn't changed prior to the system crash and "[Recovered]" to indicate that the document includes unsaved revisions. To revive these files, click the icon's drop-down arrow and choose Open to reopen the file or Save As to resave the file. If the file was corrupt before Office recovered it, you first need to choose Repairs from this list.

AutoRecover works great most of the time, and it has certainly saved users from countless hours of work, but you have to know how to use it properly. For instance, if a file you want to reopen doesn't display in the Document Recovery task pane, don't panic because you can probably still find it by using a workaround.

In the application (such as Word), choose Open from the File menu, and browse to the folder where your hard drive stores recovered files (in WinXP, the default location is C:\DOCUMENTS AND SETTINGS\<*USERNAME*>\APPLICATIONDATA\MICROSOFT\<*PROGRAM NAME*>; in Windows 98 or Windows Me, see C:\WINDOWS\APPLICATIONDATA\MICROSOFT\<*PROGRAM NAME*>). Click the Files Of Type drop-down menu and choose All Files. Recovered files have names similar to: AutoRecover Save of <file name>, followed by the program's file extension (such as .DOC). Double-click the AutoRecover file to open it. After the file is open in memory, it's wise to immediately resave it, using a different name this time.

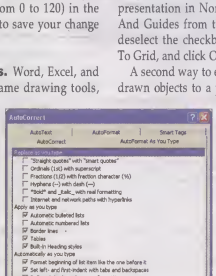

Security
Security Level
Trusted Sources
High. Only signed macros from trusted sources will be allowed to run. Unsigned macros are automatically disabled.
Medium. You can choose whether or not to run potentially unsafe macros.
Low (not recommended). You are not protected from potentially unsafe macros. Use this setting only if you have virus scanning software installed, or you are sure all documents you open are safe.
Virus scanner(s) installed.
OK
Cancel

Setting a High security level for running macros is generally a good idea. But if you regularly use macros in your applications, perhaps selecting the Medium level is a more appropriate choice.

One final note about AutoRecover: Some people become disappointed when they realize that the recovered file doesn't include all of their changes. The actual data included in a recovered file depends on how frequently the program automatically saves changes; the default setting is only every 15 minutes. To change this setting, click Options from the Tools menu and choose the Save tab. In the Save AutoRecover Info Every X area, type a number (from 0 to 120) in the Minutes field. Click OK to save your change and close the dialog box.

■ **Drawing Dilemmas.** Word, Excel, and PowerPoint share the same drawing tools, which makes things easier for Office users because they only need to learn about one set of tools; however, there are some universal frustrations with these drawing tools, too. Let's look at the drawing features that cause the most frustration, and then run through some workarounds and fixes.

First, it can be tricky to move freeform drawn objects, such as circles, to precise locations. When you try to move the object with the mouse, it can seemingly jump to an invisible point. If you ditch the mouse in favor of pressing Arrow keys on your keyboard, the object often moves too much. The bottom line? Frustration.



If you dislike some of the automatic formatting options found in Microsoft Word, look for these options in the AutoCorrect dialog box and disable them.

To fix this, turn off the Snap Objects To Grid feature, which makes an object line up with invisible points. For example, in Excel, a square will line up with the cell borders when the Snap Objects To Grid feature is active. To temporarily bypass the Snap Objects To Grid feature, press the ALT key on your keyboard as you're dragging the object. This should help you place the object in a precise location.

For a more permanent solution, turn off the Snap Objects To Grid feature for good. The steps are slightly different in the various programs. In Word, click the Draw command on the Drawing toolbar, choose Grid, deselect the checkbox next to Snap Objects To Grid, and click OK. In Excel, display the Drawing toolbar and then choose Draw, Snap, To Grid. In PowerPoint, display the presentation in Normal view, choose Grids And Guides from the Draw button's menu, deselect the checkbox next to Snap Objects To Grid, and click OK.

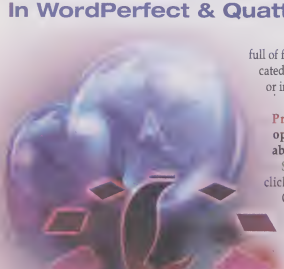
A second way to ensure that you can move drawn objects to a precise location is to use the Arrow keys on your keyboard instead of the mouse. By default, a selected object moves six pixels each time you press an Arrow key. To nudge the object in tiny 1-pixel increments, hold down the CTRL key as you press an Arrow key.

■ **Make Some New Habits.** Armed with these ideas, you should have a much smoother ride the next time you need to get some work done using Office's applications. Now, let's just hope the work you're trying to finish is just as easy. LS

by Linda Bird

Corel Office Suite Annoyances

Solutions To The Problems That Arise In WordPerfect & Quattro Pro



Loved by its long-time users along with anyone opposed to Microsoft products on principle, WordPerfect Office continues to hold on to its niche in the suite showdown. Whether it runs more smoothly than its archrival is the subject of endless debate, but no one can argue that either of the suites is error-free.

Whether the trouble that plagues your WordPerfect experience is the result of a bona fide software bug or simply a slightly confusing interface doesn't matter when you're the one just trying to get your document finished. In this short survey of possible glitches you might encounter in WordPerfect Office, we'll focus mainly on WordPerfect itself and Quattro Pro, the most famous members of the Corel (http://www.corel.com) suite and by far the most used. Skim through to see if one of these known issues vexes you; at the end of the article, we'll provide some tips for further research.

■ **Word Not-Quite-Perfect.** The star of the suite, WordPerfect is a word processor full of features, options, and, like any complicated piece of software, the occasional bug or interface frustration.

Problem: The password-protect option is grayed out and unavailable in WordPerfect 10. What's up?

Solution: Open WordPerfect 10, then click Tools, Settings, and finally Files. On the Document tab, click the box next to Use Default Extension On Open And Save. Click Apply, and then OK. The password-protection option should be available again.

Problem: You try to disable "active" hyperlinks in a document according to the directions in the Help file, but it does not make sense.

Solution: Don't believe everything you read. The Help file is incorrect on this point. Instead of instructing you to click Tools, Hyperlinks, and Environment, it should say click the Tools menu, then Settings, and finally Environment. On the General tab, disable the Activate Hyperlinks check box.

Problem: When you attempt to type a date, such as 1/2/2003, the 1/2 part appears as a ½ fraction.

Solution: WordPerfect includes a Quick Correct feature that automatically fixes many common errors, but sometimes it might get a little carried away. If you really were trying to type a fraction, you may appreciate the help; here, the unwanted formatting just gets in the way. To stop this particular fix, delete the ½ entry in QuickCorrect. Choose QuickCorrect in the Tools menu, click the 1/2 on the list, and click Delete Entry.

Problem: How can I print specific multiple pages without printing everything in the entire document?

Solution. Some problems are only problems if you do not realize that WordPerfect has an answer easy at hand. In this case, just click the Print button on the toolbar, then look in the Print Range box on the Main tab. Click the last option, Pages. In the blank space to the right, type the page numbers you want to print using commas and hyphens. For example, typing **1-3, 4, 9-11** will print pages 1, 2, 3, 4, 9, 10, and 11. If you want to print from page four to the end of the document, you can type **4-0**, with the zero signifying the end.

Problem: You find it odd that when you try to select a word with a double-click and then select underline, both the word and the space are underlined. The same goes for other commands, such as cut and copy. That pesky space always seems to be included.

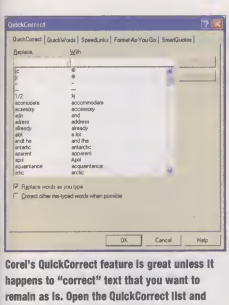
Solution: Some problems are really just new or changed features as you upgrade from one version of WordPerfect to the next. If you don't like the new behavior, you can change it. From WordPerfect 10, click the Tools menu option and choose Settings, then Environment. Click the General tab. Then click the Enable The Use WordPerfect 9 Text Selection box. The double-click select behavior you've come to expect will return.

Problem: Word Perfect page numbers in the format -1- change to 1— after the spell checker runs through the document.

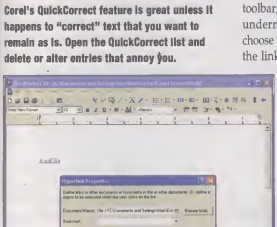
Solution: This is one of the many bugs large and small that Corel's Service Pack 2 corrects. If you have not applied the Service Pack yet, head for the main Corel Web page (http://www.corel.com), click the Support link near the top of the page, and then scroll down to the Service Packs & Patches link under the Downloads heading. Click the link, and then choose the program you want to update and the correct version number.

Problem: You're used to using Microsoft Word, and WordPerfect formatting seems completely screwy.

Solution: WordPerfect and Word see the world in different ways. With WordPerfect, the thing to remember as you try to sort out formatting conundrums is that almost every formatting command has a beginning tag and an ending tag, somewhat like the HTML (Hypertext Markup Language) used for writing Web pages. Sometimes the key to understanding what's going on with your document



Corel's QuickCorrect feature is great unless it happens to "correct" text that you want to remain as is. Open the QuickCorrect list and delete or alter entries that annoy you.



If WordPerfect insists on trying to open hyperlinked files created in other programs, edit the hyperlink information to force WordPerfect to share.

is to use the Reveal Codes command so you can see these tags. Press ALT-F3 at any time and the WordPerfect screen splits in two, with the bottom portion showing nearly every formatting command at work in your document. Many of the tags are self-explanatory; if you see one that doesn't belong, drag it out of the Reveal Codes pane.

Problem: WordPerfect always starts with the same document style, but you might save time if you changed the default style to something that more suits your needs.

Solution: In WordPerfect 10, click Document in the File menu, then click Current Document Style. Change the document however you would like. For instance, you might adjust the margins or set a particular default font. When finished, click the Use As Default checkbox and click OK. Click Yes to apply the new document style to all new documents.

Problem: You attempt to follow a hyperlink in a WordPerfect file to a non-WordPerfect document, but the program does not recognize the file type and you are unable to open the file.

Solution: Creating hyperlinks in recent versions of WordPerfect is pretty simple. Just select the text, then click the Hyperlink button on the toolbar; it looks like a spiderweb with a chain underneath. In the dialog box that appears, choose the file or Web location associated with the link. If you pick a non-WordPerfect, non-Web file, however, WP often unsuccessfully attempts to open the file in WP itself rather than calling upon another program, such as Adobe Acrobat, that might know how to deal with the file. Force WP to hand the task to another program by right-clicking the hyperlink and choosing Edit Hyperlink. In the Document \Macro line, add FILE:// before the file path. Try the hyperlink again.

Problem: This looks like a biggie. When you try to start up WordPerfect 10, all you see is an error message stating, "Wpwin10 has generated errors and will be closed by Windows." That's it.

Solution: Something has corrupted your WordPerfect 10 installation, and you're going to have to reinstall the program. Rather than just pop in the CD, however, you first must erase some parts of the current installation so things will run smoothly. Start your chore by renaming a WordPerfect folder. Double-click My Computer and browse to Documents and SETTINGS\APPLICATION DATA\COREL. Right-click the WordPerfect folder and click Rename. Change the name to WordPerfectOld.

Now delete the WordPerfect Registry key. Click Start, Run, and type **regedit**. Click OK. In the Registry Editor, make a backup by selecting Registry, then Export Registry File. Save it to the Desktop as "Backup." Now click the plus sign (+) next to HKEY_CURRENT_USER, then the plus sign next to Software. Click the plus sign beside Corel, right-click WordPerfect, and choose Delete. Click Yes and close Registry Editor.

Try to open WordPerfect. The program will ask for the WP CD. Insert the CD and follow the on-screen instructions.

Problem: In WordPerfect 9, you receive the error "WPWIN9 Caused An Invalid Page Fault in module WPWIN9.EXE at 015f:00595e8e" when you try to start the program.

Solution: Those page faults have struck again. You can correct this and other major errors by unregistering and then reregistering WordPerfect components on your computer. Fortunately, Corel includes a utility program called PFREG.EXE that makes the job rather simple. To run PFREG.EXE, click the Windows Start button and then click Find or Search. In the search box, type **PFREG.EXE**. Make sure the search utility is looking in the correct drive.

When PFREG.EXE turns up in the results screen, double-click it. When all of the components are listed as found, click Unregister. After you have unregistered all components, click Register. Click Close once these steps are completed.

Problem: In migrating from WordPerfect 9 to WordPerfect 10, you seem to have lost all of your customized toolbars, styles, macros, and other features. Everything is back to the default style.

Solution: This takes a bit of work, but it is worth it if it would take even more time to reset all of your customizations. Browse to the PROGRAM FILES\WORDPERFECT OFFICE 2000\TEMPLATE\CUSTOM WP TEMPLATE folder on your C: drive. Right-click WP9US.wpt and choose Copy. Open the WINDOWS\APPLICATION DATA\COREL\PERFECTEXPERT\10\CUSTOM WP TEMPLATE folder. Right-click inside the folder and choose Paste.

Now open Quattro Pro 10 and click File, then New From Project. Under the Create New tab, pick Custom WP Templates from the pull-down menu. Left-click Create A Blank Document to highlight it, then click Options and Edit WP Template. On the toolbar, choose Copy/Remove Object. In the dialog box, choose WP9US as the Template to Copy from, and choose toolbars, styles, macros, and other selections from the Object Type list. Click the Copy button. When finished, click Close. Your customizations should appear in WordPerfect 10.

Paradox lives up to its name in this instance by letting you create all sorts of complex databases but confusing itself when you want to print one.

Problem: After upgrading from Word Perfect 5 or Word Perfect 6.1 to WordPerfect 10, you cannot open your old files anymore.

Solution: The Typical install option of WordPerfect 10 does not include the correct conversion files to open these older WP documents. You need to do a custom installation instead. Put the suite CD in the drive and follow the installation instructions that appear. Choose Custom Setup from the Setup options list and install the necessary Conversion File Types.

Problem: WordPerfect was working fine, but after you installed some other software, the Spell Checker, Thesaurus, and Prompt-As-You-Go features are no longer available.

Solution: Put your WordPerfect Office 2002 suite CD back in the drive and, when the install screen appears, select Update Installation. This should correct whatever threw WordPerfect off track. This is a good trick to try whenever installing another program seems to trip up WordPerfect.

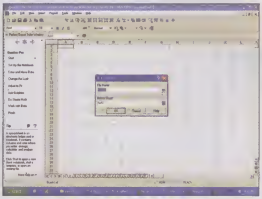
Problem: On a Windows XP system where the default folder is on a network, you experience a delay as WP scans all drives before the Open File dialog box appears.

Solution: You're likely using the Folders view in the Open File dialog box, which displays the hierarchical list of system folders on the left side of the screen. To eliminate the delay, disable the folder view. In the Open File box, click View and then click Folders to remove the check mark.

■ **Paradoxical.** Paradox, the Corel suite's database component, is not the kind of program someone might pick up simply by tinkering with the buttons for a few hours. Even for the relatively more experienced, a database can throw a few curveballs.

Problem: Paradox adds a blank page for every printed page when you attempt to print out a report.

Solution: Paradox lives up to its name in this instance by letting you create all sorts of complex databases but confusing itself when you want to print one. What's happening is the program mistakenly thinks it needs to overflow data to a second page. To work around this problem, click Print in the File menu and look for the Overflow Handling drop-down list in the Print dialog box.



One way to retrieve data from a corrupted Quattro Pro file is to attempt to insert the file into a clean, blank notebook. Look for the Insert File option in the Insert menu.

Choose Clip To Page Width in the list and click Print to see the result.

Problem: In Paradox 9, you try to open the program but see only the error message "Cannot Initialize BDE: Directory Is Busy."

Solution: The last time you used Paradox, it must have crashed. Although many programs are getting better about recovering from crashes, in this case you will need to restart Windows for the software to work correctly again.

■ **Quattro Pro-blems.** Sporting many genre-defining spreadsheet features, Quattro Pro boasts an enthusiastic following. That doesn't mean everything always adds up.

Problem: Like a few other users, you encounter a screen flicker when moving the mouse about the Quattro Pro 10 application window.

Solution: Try changing the Recalc setting from Background to Manual, Corel advises. Why this should affect screen flicker we are not quite sure, but here's how you do it: First, click Format, then Notebook properties. Click the Recalc Settings tab, then the Manual option in the Mode area.

Problem: In Quattro Pro 10, you click Tools, then Spell Checker, but you do not see the expected Writing Tools dialog box with all the Spell Checker, Thesaurus, and Dictionary options.

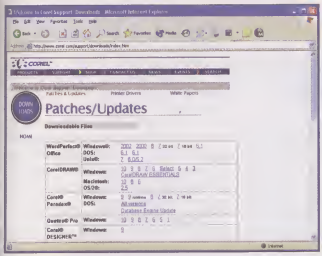
Solution: A program bug can make the Writing Tools box unavailable depending on the font size you are using. Change the display fonts to Normal and the Spell Checker should return. You will need to change your Windows settings for this one. Click the Start button, then Settings, and finally Control Panel. Open the Display Applet. On the Settings tab, click Advanced. On the General tab, change the Font size to Small Fonts. Click Apply and OK. Windows may ask you to reboot.

Problem: Being familiar with the Publish to PDF option in WordPerfect, you try to save a Quattro Pro spreadsheet in Adobe's PDF (Portable Document Format). The location of the command seems to elude you.

Solution: WordPerfect has a leg up on Quattro Pro in this department. The spreadsheet program does not include the PDF option. One workaround is to copy and paste your spreadsheet information into a WordPerfect document and publish the WordPerfect file to PDF. This might not work very well if your spreadsheet is very large or complicated, but it is worth a try.

Problem: Certain Quattro Pro files will not open, no matter how much you yell at them.

Solution: The files may be damaged, perhaps from an application crash. You will want to transfer what information you can



The Corel Web site offers numerous support options, including downloadable patches and service packs.

out of them. Reboot the computer and, when Windows loads, close any programs that start automatically. Open Quattro Pro, click the Insert menu, and choose Insert File. Browse to the troublesome file and click OK. The data may import into the blank file. If so, save the new file and delete the old, damaged file.

If that doesn't do the trick, try what is called a "repair switch." Click the Windows Start menu, click Run, and type **QPW.EXE /R1 *<path>***, (where *<path>* is the path to your damaged document) in the space that appears. Click OK. Another solution to try is using the switch R2 rather than R1.

Problem: When you attempt to open Quattro Pro, you receive the ominous-sounding error message "QPW caused an invalid page fault in module QPW.exe."

Solution: There is no need to start checking through modules looking for those nasty "invalid page faults." What's really happened here is Quattro Pro has inadvertently corrupted one of its configuration files, which stores all sorts of information necessary to get QP up and running. You will need to replace the configuration files, which isn't as difficult as it sounds.

First, click the Windows Start button, select Find or Search, and type **QP*.CFG** in the File Name box. The asterisk is a wildcard that tells Windows to look for all files beginning with QP and the file extension .CFG, which stands for configuration. Click the Find Now or Search button (depending on your version of Windows) and wait for the search to complete.

In the list of found files, start at the top and right-click the first file. Choose Rename from the pop-up menu, and change the file's extension to .OLD. You could just delete the files, but in case something goes wrong, you might want them around. When you are finished, open Quattro Pro again. The program will create a new set of configuration files without the error that cropped up in the last batch. Note that some of your customized settings have probably disappeared during the switch back to default files.

Problem: After downloading and installing WordPerfect Office 2002 Service Pack 2, Quattro Pro crashes whenever you click the Tools menu.

Solution: Sometimes even bug fixes themselves have bugs. You might be able to solve this simply by reinstalling the Service Pack after making sure no other programs are open at the same time. That goes for antivirus programs, as well as anything else that tends to run in the background.

If you have tried reinstalling the Service Pack and the error still occurs, try deleting all of the Quattro Pro configuration files. Look at the first problem above in the Quattro Pro section for details on how to do this. Assuming a fresh set of configuration files fails to cure your Quattro Pro problems, you might have to reinstall the whole suite.

Problem: The x-axis of a line chart may not appear when the chart has more than 127 data points.

Solution: This is a bug in the software. You can work around the problem by creating a scatter chart instead of a line chart.

Problem: You are having trouble using Quattro Pro's sort function with cells that contain formulas with cell references.

Solution: You must use the dollar sign ($) symbol before each cell reference to make them absolute values. After adding the dollar sign, attempt your sort again.

Problem: In Quattro Pro 10, the @ value function with a prefix before the number returns a 0. This problem did not occur when you used it in Quattro Pro 9.

Solution: This is a bug that popped up in Quattro Pro 10. To fix it you will need to do a bit of Registry editing. Select Run from the Windows Start menu, type regedit in the Open field and click OK. In the editor, browse to HKEY_CURRENT_USER\SOFTWARE\COREL\QUATTROPRO\10. Click the Configuration folder. In the window on the right side, right-click Do Not Convert Strings to Nums. Select Rename and type **Don't Convert Strings To Nums**. In other words, we're changing "Do Not" to "Don't." Close the Registry Editor and reopen Quattro Pro. The function should work as you remember.

■ **Check Your Options.** If you have not found your favorite WordPerfect Office problem in this short smattering, one of many Corel resources might hold the key. At the top of the list, of course, are the suite's Help files, which are always available to give you assistance with common interface issues.

As was mentioned above, having the latest Service Pack or Hot Patch also is a must. When cruising around the Corel Web site, make sure you are in the right support area for your version of the WordPerfect Suite. To figure out the vintage of your program, click the Help menu and choose the About option. Somewhere in the dialog box that appears is the version information.

Besides the software patches, bug fixes, and other updates, the Corel site contains useful tips for dealing with all kinds of issues. On the Support Services page, scroll down until you see links for the Corel Newsgroups and Corel Knowledge Base. Newsgroups let you pose questions or provide solutions to other users of Corel programs. The Knowledge Base is a searchable database of bugs, confusions, and workarounds identified mainly by support personnel helping customers over the telephone. Someone else's journey through the mysteries of the WordPerfect suite might provide a map for your own wanderings. LS

by Alan Phelps

The Trouble With Lotus' SmartSuite

Problems & Solutions To Help You Get The Most From The Suite

Lotus SmartSuite is a collection of programs many used to love but relatively few today use when compared to giant Microsoft Office and distant second Corel Office. Still, fans of this venerable software would be loath to give up Organizer, 1-2-3, or Word Pro.

Even when problems creep up and one's satisfaction with her chosen office suite is on the wane, there is a remarkable resiliency in the affection a forgiving minority of users show to SmartSuite. Perhaps it's tradition. Maybe it's just the embracing of anything that isn't Microsoft. Whatever it is, this dedication is tested as is any program with the occasional bug, crash, and confusing feature. We will run through a few of the most common below along with ways you can get back to enjoying that SmartSuite experience.

■ **Word Pro Wackiness.** The hardest-working part of any suite is the word processor, which means even minor Word Pro flaws can be mighty annoying.

Problem: Users new to SmartSuite might be a bit confused by the incredible disappearing Toolbar buttons. Just when you're thinking about clicking a button to access a particular feature, it seems to have flown the coop.

Solution: Lotus vets will tell you that you're likely witnessing one of the suite's features: Toolbar buttons show up when they might be useful and make themselves scarce during the times when users cannot use them anyway. Take commands dealing with tables. Click inside a table and a host of buttons for various table-related commands appears on the Toolbar. Click outside the table and those buttons go away. It is the SmartSuite way of saving screen space and hopefully making the interface a bit less cluttered.

Problem: Where is the Save button?

Solution: It was there all along. Contrary to WordPerfect and Word convention, Word Pro uses what users might think is the Close Document icon for the Toolbar's Save button. It's the folder with the arrow pointing down. Of course, you can always press CTRL-S.

Problem: When you attempt to import a Microsoft Word document, Word Pro does not display some of the formatting and other elements correctly.

Solution: Unfortunately, there is not always a solution to this problem. The two programs look at things differently, and some incompatibilities will creep into more complex documents. You can try to open the document in Word and try to simplify it; a little experimentation might be necessary to find what works best for different types of formatting. If you are really having trouble, you can almost always import at least the text from a document by copying it into a Notepad file and copying the Notepad text into Word Pro.

Problem: When you try to underline the first word of text in a numbered list, underlining also appears under the number. There seems to be no way to keep it from happening.

Solution: Lotus is aware of this bug in Word Pro 9.7, 9.6.1, and 9.6. To fix it, you'll need to download a software patch from the Lotus Web site. Browse to the Lotus Word Pro Web page (http://www-3.ibm.com/software/lotus/support/wordpro/support.html) and look for the Support Downloads link. Scroll through the patches and look for the one called Patch To Fix Incorrect Underlining Of Number In A Numbered List. Click the link and download the appropriate version for your Word Pro release. If you use version 9.6, you'll need to install another update first; read through the instructions on the Web page about the underlining patch.

Problem: Word Pro won't even open, saying that it has "generated errors" apparently on its own. The errors are such that it cannot do anything but close. Sounds like a Monday.

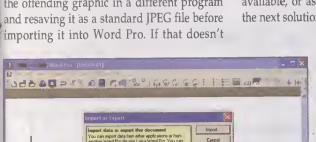
Solution: This is a dandy of a problem, and the solution is not always easy. If the program worked before, think about what has changed on your system since the last time Word Pro opened. In one case of this error, it turned out a printer with an incompatible print driver had been installed on the system. When another printer was installed, Word Pro opened successfully once again. This might also be a time when reinstalling the application may help.

Problem: Attempting to import certain JPEG (Joint Photographic Experts Group) graphics into Word Pro documents sometimes produces an error message and crashes the program.

Solution: This is a frequently observed phenomenon in Word Pro caused by the fact

Word Pro will not open a document with more than 65,408 paragraphs, so you might have to divide a large document into two smaller documents.

that not all JPEG files are created alike. The vast number of scanners and digital cameras available today leads to a zoo of JPEG variants, and Word Pro does not support some of those file types. Lotus recommends opening the offending graphic in a different program and resaving it as a standard JPEG file before importing it into Word Pro. If that doesn't work, try converting the graphic to GIF (Graphics Interchange Format) or BMP (bit map) format.



If you suspect your WordPro file is corrupted or otherwise damaged, try importing the data into a blank file using the Import/Export command under the File menu.

Problem: Newer versions of Microsoft Word let users use the familiar ALT-TAB key combination to switch between open files. ALT-TAB does not cycle through multiple Word Pro files.

Solution: Another easy key combo does the same trick: CTRL-TAB. If you've got more than one Word Pro, 1-2-3, or other SmartSuite file open, press CTRL-TAB from within the relevant program and watch the document names switch on the title bar until you come to the one you want.

Problem: Word Pro is unable to open a particular file or import a picture. Instead, all you see is an error message saying the program "Cannot import file."

Solution: It is likely the file is too large. Try opening the document in another application if one is available. Word Pro will not open a document with more than 65,408 paragraphs, so you might have to divide a large document into two smaller documents. If the document won't open in any program, it might be corrupt. Hopefully there is a backup available, or as another option, you can read the next solution.

Problem: After upgrading to a new version of Word Pro, you encounter problems opening your old documents. Error messages relating to "reference memory" and "invalid page faults" pop up and the program may crash when you scroll.

Solution: This unfortunate bug is known to Lotus and should only affect users upgrading to release 9.5. The solution, however, might come in handy when other, less common program bugs corrupt your Word Pro files. If you ever have problems opening a particular document or batch of documents that do not show up with new documents, corruption might be at work.

Start by creating a blank document saved with the .LWP file extension, the standard Word Pro file. From the File menu, choose User Setup, then Word Pro Preferences, and finally the Enable tab. Deselect the options Bubble Help, Consistency Check, and Background Printing, and click OK. Then go back to the File menu and choose Import/Export. Select the radio buttons marked Import Data From Another Application (Or Word Pro file) and Import At The Current Insertion Point, then click Import. Choose one of the corrupted documents and click Open.

As soon as the file imports, choose Import/Export from the File menu again. Do not save the document. Next, select Export Your Document Into Another File Format for the first option and Lotus Word Pro for the second. Then click Export. Now name the file and save it as a Lotus Word Pro SmartMaster file with a .MWP file extension. Close all open documents and then open the .MWP file you just created. If it looks OK, use Save As in the File menu to save it with the standard Lotus Word Pro (.LWP) format.

Problem: The Lotus suite software does not seem to install correctly or install at all, and there is no error message to tell you the reason.

Solution: This might be a case of hardware trouble, but if you are upgrading from one Lotus version to another, you should also check out the Readme file before attempting to install the suite. The company also recommends installing version 9.7 to the same drive and directory as the version you are replacing. Users who are unable to get their computer to even see the SmartSuite installation disc should try rebooting the system with the CD already loaded.

Problem: Even though you have a printer, Word Pro returns the error message "Your system does not have a default printer driver. Formatting for the screen."

Solution: Not only do you have one printer, it sounds like you probably have a couple. Word Pro is not sure which one to use. Go to the File menu, choose Document Properties, and click Print Setup. Choose the radio button next to Default Printer or Specific Printer. Choose a printer from the drop-down menu if needed. Click OK. To keep from seeing this error again, go to the Windows Control Panel (click the Start button, choose Settings, and click Control Panel) and double-click the Printers applet to open it. Right-click a printer and choose Set As Default Printer from the pop-up menu.

■ **Easy As 1-2-3.** If you're a numbers person, making sure Lotus 1-2-3 runs smoothly for you can be the difference between order and chaos.

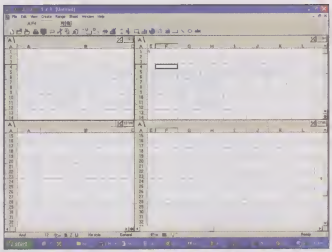
Problem: The scroll bars and grid lines in your 1-2-3 spreadsheet have disappeared.

Solution: By design, a user can switch these elements on and off, and it could be that

someone else sent them into hiding. To bring them back, click the File menu and Workbook Properties. In the dialog box that appears, click the View tab and click the checkboxes next to the features you want to show in this worksheet.

Problem: For purposes of printing out your spreadsheet, you want to fit the data you need on one page.

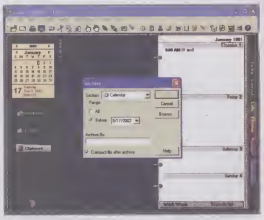
Solution: The name "spreadsheet" implies a document that needs room to spread out, but there are a few adjustments you can make if you don't need to display all of your data at the same time. First, try different widths by moving the cursor to the boundaries between the tops of the columns and dragging the lines left and right. You can even hide columns away by squeezing them down completely. Another trick is to select only the area of the spreadsheet you want to print, click the Print command, and choose Selected Range near the bottom of the Print dialog box.



When you need to see more than one area of a large Lotus 1-2-3 spreadsheet, use the split-screen function to divide the available space into two or four windows. Then scroll independently in each window to different spreadsheet locations.

Problem: You need to see several parts of a large spreadsheet on the screen at the same time.

Solution: Lotus makes this simple. Drag the split-screen buttons at the ends of the two scroll bars to create either two or four miniwindows. You can scroll in the windows independently to see areas of the spreadsheet that have never met until now.



Slim down your Organizer file with the Archive function for better performance. Don't worry; Organizer will still let you flip through that 1801 calendar even if you put your old appointments in the deep freeze.

Problem: When you try entering something like a phone number or date into a cell, 1-2-3 changes it to some other number.

Solution: Unless you format a cell differently, 1-2-3 assumes you're trying to enter a formula. Thus, it may read a date such as 1-1-2003 as a mathematical equation, and the program will return the answer of -2003. A quick way to tell 1-2-3 that you're entering text that it should not treat as a formula is to put a quotation mark (") before the digits. For example, "1-1-2003 will be displayed as you typed it, minus the quotation.

Problem: Your spreadsheet seems to have trouble figuring averages and the like from a range of cells. It is including blank cells in its calculations.

Solution: Those cells that appear blank might not really be blank. They may contain a space or some hidden character; for example, someone might have inserted a space to try to clear a cell. Such a cell does not count as empty to the program. Select the contents of the apparently blank cells and press DELETE.

If you suspect a column or row is hidden, move the cursor to the space at the top or side of the screen where the column or row should begin. If the cursor turns gray as you move it back and forth, there is a hidden range. When the cursor is gray, press down on the mouse button and drag it into view.

Organizer Difficulties. Dedicated Lotus users rely on Organizer to get them through the day. A bug here can bring everything to a halt.

Problem: The Organizer Calendar inexplicably turns to the year 1801, and you didn't even start attending meetings until at least 1979.

Solution: This is actually part of the planned Organizer behavior. Clicking the Calendar tab once from any other view will turn to the page that was last viewed in the Calendar. If you click the Calendar tab again for some reason, it turns to the first page of the Calendar, which happens to be January 1801. Unless you are the type of history buff who likes to keep track of daily events of the 19th century, you can quickly return to the present by clicking the Today's Date area below the small calendar in the upper left of the screen.

Problem: Your Organizer file is beginning to reach a size where it is affecting performance by slowing down Organizer operations.

Solution: On occasion Organizer users should compact their data files and archive older entries. To compact a file, close it with the Close command in Organizer's File menu. Then click File again and choose Compact. Navigate to your file, select it, and click the Compact button.

Archiving entries moves them out of your current file and into an archive file where you can still access them if necessary. Open the file you want to archive and select Archive from the File menu. In the dialog box that appears, choose the section you want to clean up. Select either the entire section or before a particular date. Type a name for the archive file and select Compact File After Archive. Click OK.

Repeat these steps to archive other sections of your file. To read the archived entries, use the Open command under File to load the archive.

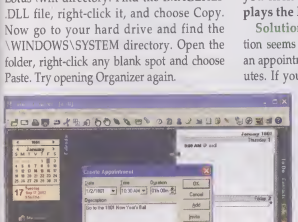
Problem: When you attempt to launch Organizer, you see errors such as "Cannot Load OrgAPI32.dll," "Cannot find file

Being a software suite, Lotus has thrown in a few extras that attempt to tie together all of the separate programs.

c:\lotus\organize\org6.exe or one of its components" or "Could not locate the file c:\windows\imagehlp.dll."

Solution: According to the Lotus support site, why this should happen at all is still being investigated. Even if the techs can't explain it, they've at least come up with a workaround that often works. You should replace the IMAGEHLP.DLL file from the Lotus CD.

To begin, insert the Lotus disc and open the Lotus\win directory. Find the IMAGEHLP .DLL file, right-click it, and choose Copy. Now go to your hard drive and find the \WINDOWS\SYSTEM directory. Open the folder, right-click any blank spot and choose Paste. Try opening Organizer again.



Organizer's Pencil In option can be handy, but not if it does not go away on command. Set the appointment duration to anything longer than 0 to avoid the problem.

Problem: In the Calendar's Day Planner view, you can't link a Call entry to the appropriate Contact entry.

Solution: A corrupted Organizer file may be to blame. Try exporting each section (such as the Calendar, your Contacts, and so on) out and then importing them into a new Organizer file. First, open the damaged file and click the first section. In the File menu, choose Export. In the Files Of Type list, pick Text-ASCII Delimited (*.TXT). Name the file and click Export. Now create a new Organizer file, turn to the same section, and click Import in the File menu. In the Files Of Type list, pick the Text-ASCII option again, browse to the file you just exported, and click Import. Repeat these steps for each section in the corrupted file. When you're finished, save the new file with a new name.

Problem: You return to a previously created appointment where you had clicked the Pencil In option. You try to uncheck the Pencil In option, but after you click OK, the appointment still displays the Pencil In icon.

Solution: According to Lotus, this situation seems to happen when the duration for an appointment was set at 0 hours and 0 minutes. If you set the duration to any amount greater than 0, you should be able to avoid the problem. Another workaround is to use the Appointment Menu to create the appointment.

Problem: In the Create Appointment dialog box, you pick a future date and then click the Description field. The current date replaces the future date you just entered.

Solution: One way to deal with this is to click the Start button, choose Settings, click Control Panel, and double-click the Regional Settings icon. On the Date tab in the Regional Settings Properties dialog box, change the short date style from dd-MMM-yy to MM/dd/yy or some other setting. Another way to avoid the problem is to create the appointment by double-clicking the future date inside the Calendar pages rather than using the Create Appointment toolbar button.

Problem: Installing SmartSuite caused a new Taskbar-like Lotus "drawer" bar to appear at the top of my screen whenever I start the computer. Shutting this down all the time gets old.

Solution: Being a software suite, Lotus has thrown in a few extras that attempt to tie together all of the separate programs. If you don't like the SmartCenter bar, click the Start button, browse to the Startup folder mixed in with all of the programs, and drag the SmartCenter icon out of Startup and into the Lotus SmartSuite folder. That way you can launch the SmartCenter if you should ever change your mind, but it won't automatically load with Windows.

■ **Seek The Source.** Bugs, glitches, and other odd behavior not mentioned here are frequently the targets of the Lotus team's efforts, and the results of their labors are on display at the IBM Lotus Web site. Fire up your browser and head to the Lotus Support Services page (http://www-3.ibm.com/software/lotus/support) for information about errors less common but more numerous than we have space to describe here.

In the drop-down menu near the middle of the main support page, pick the product that you want to learn more about. Click the Technote Alert link to see a searchable database of problems other customers have reported and their possible solutions.

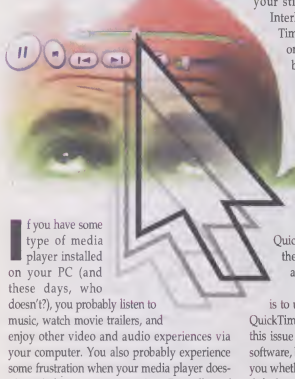
Another good idea in tackling almost any software problem is to make sure you have the latest software code from Lotus. Any major bug has undoubtedly been brought to the company's attention and is likely the focus of a fix. After choosing an application at the main support page, look for the link in Support Downloads. This is where you will find all of the patches and updates available for a particular program. Follow the on-screen instructions to install them properly.

Unless your problem is fairly rare, you're likely to find tips either in the suite's Help menus or on the Lotus Web site. Expand your search to the Web at large if necessary. Before long, you'll be back in that SmartSuite happy place. LS

by Alan Phelps

When Media Players Won't Play

Cope With Headaches Found In QuickTime, RealOne Player & Windows Media Player



If you have some type of media player installed on your PC (and these days, who doesn't?), you probably listen to music, watch movie trailers, and enjoy other video and audio experiences via your computer. You also probably experience some frustration when your media player doesn't work the way you expect it to. Regardless of whether you're using Microsoft's Windows Media Player, RealNetworks' RealOne Player, or Apple Computer's QuickTime player, you're bound to run into a few glitches from time to time. Here are solutions to some of the more common problems.

QuickTime. QuickTime's strength lies in its ability to play movie clips. Even though Apple Computer is the developer of QuickTime player (free; http://www.apple.com/quicktime), the software also runs fine (usually) on Microsoft's Windows OSes (operating systems), be it Windows 98 Second Edition, Windows Me, or Windows XP. Still, there are some snags you'll probably encounter (if you haven't already) and need to overcome.

For example, you may notice that some of your still images and AVI (Audio-Video Interleaved) files are now in the QuickTime format rather than the format you originally saved them as. This is probably because QuickTime designated itself as the default viewer on your system after you installed it. Older versions of QuickTime (anything released before version 5) typically exhibit this type of behavior and "take control" of certain types of files, including AVI and GIF (Graphics Interchange Format) files. As a result, double-clicking one of these files launches the QuickTime player. The good news is that the cure to this problem is quick, easy, and best of all, free.

The best way to correct this issue is to upgrade to the most recent version of QuickTime, which is QuickTime 6 (at the time this issue went to press). When you install the software, be sure to deselect the option that asks you whether you'd like to make QuickTime the default software for other file types.

To configure your QuickTime player so that movies launch automatically (without requiring you to click the Play button), click Edit, Preferences, and Player Preferences. Select the checkbox next to Automatically Play Movies When Opened and click OK.

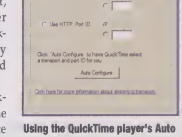
After you install QuickTime and try to use it for the first time, you may notice that video files appear erratic if you try to download and pay them over the Internet. An incompatibility between your Internet connection speed and the QuickTime setting is probably causing this problem. If you connect to the Internet via a dial-up modem, for instance, and QuickTime assumes you're running a high-bandwidth connection, the player may attempt to transmit data faster than your connection can handle.

To fix this problem, launch the QuickTime player, open the Edit menu, and click Preferences and QuickTime Preferences. In the QuickTime Settings dialog box, choose Connection Speed from the drop-down menu. Then, find and select the speed that most closely matches your Internet connection speed from the drop-down menu in the middle of the next dialog box. There are 10 settings to choose from; find the optimum setting for your system.

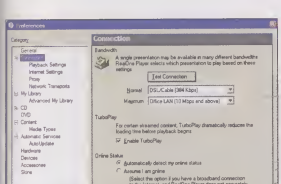
If you can't see a movie file play at all, perhaps you're trying to view a QuickTime video from behind a company firewall. This sometimes happens to users who try to view a movie online while they're connected to a company network that includes a firewall with access restrictions in place. QuickTime relies on RTSP (Real-Time Streaming Protocol) to stream content from a movie host to your PC (which saves hard drive space), but your company's firewall might block this type of transmission.

So if you can't use the RTSP protocol, you can configure your QuickTime player so that it uses a protocol such as **HTTP (Hypertext Transfer Protocol**; the standard for streaming content on the Web), which firewalls typically permit. Go to the QuickTime Settings dialog box and select Streaming Transport from the drop-down menu. Click the button labeled as Auto Configure, and QuickTime will attempt to configure itself for your firewall. If you still have problems, contact your system administrator.

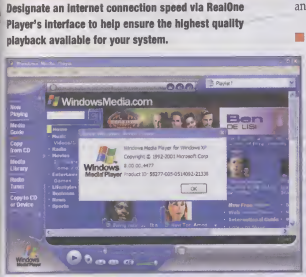
If you aren't on a network but are still having trouble viewing QuickTime files over the Internet, maybe the browser plug-in isn't configured correctly. Users running newer versions of Internet Explorer, typically 6.0, might see a broken QuickTime logo on a Web page when a faulty plug-in is to blame. This generally means you will need to download a QuickTime update from its site. Then, after downloading the update, you'll see a message window asking you


QuickTime Configuration
Streaming Transport
Use UDP RTSP Port ID
554
7070
Use HTTP Port ID
Click "Auto Configure" to have QuickTime select a transport and port ID for you.
Auto Configure
Click here for more information about streaming transport.

Using the QuickTime player's Auto Configure option might help you work around a corporate firewall so you can still download and play multimedia files.


Preferences
Category:
Connection
Bandwidth:
A single presentation may be available in many different bandwidths. RealOne Player selects which presentation to play based on these settings.
Test Connection
Normal:
DSL/Cable (384 Kbps)
Maximum:
Office LAN (10 Mbps and above)
TurboPlay
For certain streamed content, TurboPlay dramatically reduces the buffering time before playback begins.
Enable TurboPlay
Online Status
Automatically detect my online status
Assume I am online
(Select the option if you have a broadband connection to the Internet, and RealOne Player does not accurately determine your online status.)
Help
OK
Cancel

Designate an Internet connection speed via RealOne Player's interface to help ensure the highest quality playback available for your system.



The full name of the multimedia player Microsoft bundled with Windows XP is Windows Media Player for Windows XP 8.0.

to confirm your installation of the QuickTime ActiveX control. Accept the confirmation to download and install the software.

If you already downloaded and stored a multimedia file on your hard drive, but still have trouble trying to play it, perhaps that's because it's an encrypted file. Some content owners encrypt their files so that everyone must enter a media key (code used to encrypt and decrypt data; media file providers typically use media keys so only legitimate customers can play their files) to play them. Contact the individual from whom you obtained the file and ask for the media key. Then, open the QuickTime Settings dialog box and select Media Keys from the drop-down menu. Click the Add button, type the media key information in the field provided, and click OK.

To do more with video clips, such as editing them and/or saving single frames as graphics files, you'll need to download and install QuickTime Pro ($29.99; http://www.apple.com/quicktime/upgrade). QuickTime Pro lets you create MPEG-4 (Moving Picture Experts Group-4) content, play movies that consume your complete Desktop, produce slideshows, fine-tune audio and video controls, and more.

For help with other QuickTime-related headaches, visit the QuickTime Support Page (http://www.info.apple.com/usen/quicktime). Here, you'll find answers to FAQs (frequently asked questions), a discussion board, a list of downloads, and additional resources.

■ **RealOne Player.** RealOne Player (free; http://www.real.com) is an all-around media player that lets you create music CDs, play MP3 files, transfer files to portable devices via your PC, and more. There are several versions, including the RealOne SuperPass, but the standard, free software is valuable in its own right. And given the many RealOne Player features, it isn't surprising that you may have questions about it from time to time.

For example, you may wonder why you can't download and play clips from Web sites when you use the RealOne Player at work. In this case, your company is probably using a firewall to protect its network from outside invaders. Firewalls thwart hackers by limiting the types of "data" (or outside access) allowed into a system, such as by filtering out certain domains. With these restrictions in place, firewalls will occasionally filter out RealOne Player content. We recommend that you check with your network administrator to see if you can configure your RealOne Player settings to let its content pass through your company firewall. For more information, visit RealNetworks' Firewall Support Web page (http://service.real.com/firewall) and click the RealPlayer Users link for instructions about how to change your player's settings.

Another setting you may need to change in RealOne Player is its connection speed setting. If your multimedia files stutter as they attempt to play, or if you experience long buffer pauses while using RealOne Player's built-in Web browser to listen to news or music clips, the most likely cause is an incorrect connection speed setting. When you first install RealOne Player, the software detects your Internet connection and adjusts its connection speed setting accordingly. But your connection device doesn't always reflect your true connection speed. For instance, if you have a 56Kbps (kilobits per second) dial-up modem, you might find that you routinely connect to the Internet at significantly lower speeds, such as about 28.8Kbps.

To correct this issue, open RealOne Player and select Preferences from the Tools menu. In the left pane (or navigation pane) within the Preferences dialog box, highlight the Connection listing, making sure there is a plus sign (+) next to it. (If the plus sign isn't there, double-click the Connection listing or click the minus sign [-].) In the right pane, you'll now see several options. Click the Test Connection button to display the TurboPlay Connection Test. Click the Perform Test button, and RealOne Player will check your settings. After a few seconds, RealOne Player will present you with the results and ask you to click the Next button to optimize your connection speed. Click OK when you finish.

If you can't play video clips and all you see is an empty magenta square, a snowy picture, or a horribly distorted picture, the problem probably lies with your video card. Although you may have checked the system requirements before you downloaded RealOne Player and made sure that your system met the minimum set of requirements with respect to video (16-bit sound card, speakers, and a 65,000-color video display card set to a resolution of 800 x 600), it's still possible that your video card or its driver isn't up to snuff.

To test this theory, connect to the offending video, reduce the size of your RealOne Player window (if necessary to display a portion of your Desktop underneath), click (and hold) the top bar of the RealOne Player window, and continue holding down your left mouse button as you drag and drop the window to an empty area on your Desktop.

If the video was playing properly while you were dragging and dropping the RealOne Player window onto your Desktop, you can probably fix the problem by opening the Tools menu, clicking Preferences, and selecting Hardware. Next, below Video Card Compatibility, move the slider to the left (toward Most Reliable) until the line underneath states "Disable Optimized Video and

Overlays." (Earlier versions of the player have a checkbox next to Use Optimized Video Display; deselect this checkbox.) Click OK. If this doesn't solve the problem, you can contact RealNetworks' technical support staff via its Service And Support page (http://service.real.com).

Another problem users encounter involves the amount of time it takes to open My Library, even after they clean out some of their clips. To understand the cause of this problem, consider what happens when you delete files from your hard drive. True, you send them to the Recycle Bin, but unless you empty the Bin, these files still remain on your hard drive and make it perform sluggishly when it becomes too crowded. Something similar is happening in My Library.

To clean it up, open the Tools menu, click Preferences, and then click My Library in the left pane, making sure there is a minus sign (-) next to it. Then, select Advanced My Library in the left pane and click the Database button in the right pane. In the Database dialog box, click the Compact Database button. Click OK to close the dialog boxes.

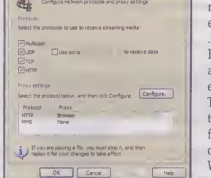
Another common problem users have with RealOne Player is recording CDs that all come out blank. If you experience this, don't worry; this is probably because the Test mode in your CD Burning Preferences is active. Open the Preferences dialog box and select CD Burning below the CD listing in the left pane. Then, deselect the checkbox next to Enable Test Mode to remove its check mark. Click OK to save your change and close the dialog box.

■ **Windows Media Player.** Depending upon your OS, you're probably using one of two editions of Microsoft's multimedia player: Windows Media Player or Windows Media Player for Windows XP (free; http://www.microsoft.com/windows/windowsmedia/9series/player.asp). Check the version name and number by launching the player and clicking About Windows Media Player from the Help menu.

To ensure that the player runs as well as it can, you should install the most recent, nonbeta version of Windows Media Player available for your OS (but make sure your sound and video cards meet its system requirements). At the time this article went to press, version 9 was still in beta form, so Win98 SE and WinMe users should run Windows Media Player version 7.1; WinXP users should use version 8.0 of Windows Media Player for Windows XP (the version bundled with WinXP). If this is not what's on your system, visit the Windows Media Download Center (http://www.microsoft.com/windows/windowsmedia/download), select the appropriate software from the drop-down menu, and let the Web page guide you through the installation process.

If the video playback appears distorted after you install the appropriate version, check the drivers for your sound and video cards. If your system has outdated drivers (especially if you updated an older computer to WinXP), you may encounter a number of distortion problems. Visit the Web sites of sound and video card manufacturers to download and install the most recent drivers.

If Windows Media Player doesn't run on the computer you use at work, a likely source of this problem is your company's firewall. Again, just like the aforementioned problems we described concerning users not being able to run QuickTime player and RealOne Player on corporate networks, perhaps your company's firewall is restricting data from your Windows Media Player application.



Windows XP users can change proxy server settings via the Options dialog box found in Windows Media Player 8.0.

You can fix the problem by changing the settings for the Internet proxy server, which acts as an intermediary between the Internet and users on a private network by filtering requests. Although we recommend that you check with the system administrator before changing these settings, you can try to change them yourself. Keep in mind that you may need to ask the system administrator for the correct proxy server information.

If you use version 7.0 through 8.0 of Windows Media Player, open its Tools menu and click Options. Choose the Network tab and click the Configure button to change the proxy settings.

If you have a version of Windows Media Player that's older than 7.0, such as 6.01, open its View menu, select Options, and choose the Advanced tab. Click Streaming Media (Windows Media) and the Change button. In the Protocols area, select the HTTP checkbox and select a radio button next to the most appropriate configuration option. For example, if your network uses a proxy server to intercept Internet requests (such as trying to view a Web page), select Use Proxy. If you select Use Proxy, click the Configure Proxy Settings button and enter the name of your proxy server and the port number it uses.

Although Windows Media Player runs many types of video files, it doesn't run all of them. Some developers create multimedia files for specific media players. For example, files using the .MND extension are RealOne music files, and files using the .QT extension are QuickTime movie files. If you try to play one of the files we just mentioned or another type that Windows Media Player doesn't support, you'll need to use the associated media player.

To see what files your Windows Media Player version can play, open the File menu, click Open, and look at the options available from the Files Of Type drop-down menu. Your Windows Media Player version can play files using any of the extensions shown here, including .WAV (Waveform audio file), .MID (music file created with the MIDI [Musical Instrument Digital Interface] protocol), and .MPG (animation file using the MPEG [Moving Picture Experts Group] standard).

For more information about your Windows Media Player, check its Help file or visit the Windows Media Player Support Center (http://support.microsoft.com/default.aspx?ID=FH;EN-US;wmp).

■ **One Final Note.** Developers are continually updating and releasing new versions of these media players, so it's a good idea to periodically check their Web sites. Having the most recent software version can eliminate many of the problems you might otherwise encounter. LS

by Heidi V. Anderson

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Reconcile Your Accounts

Move Past Common Money & Quicken Problems

Personal finance software is supposed to make managing your money a carefree experience. Of course, if handling checkbook problems can cause a headache, handling software problems might give you a migraine. The top two personal finance programs are Microsoft Money (http://www.microsoft.com) and Intuit Quicken (http://www.intuit.com). We'll take a look at each and some of the ways to keep them crunching numbers rather than your patience.

We'll start with a general warning: If you have trouble installing either of these programs on Windows XP, make sure you are logged into an Administrator account (which has the clearance to install programs). If your PC is part of a network and you do not have access to an Administrator account, ask the Administrator to either install the program for you or change your access from Limited to Administrator.

Money Mishaps. We'll start with one of the most common Money questions: Which version and configuration of Money should I buy? Each year's version adds new features. For instance, one of Money 2003's many new features is a Bill Estimator that can estimate the amount of variable-amount bills, such as your electric bill, based on past bills. You can find a detailed list of Money 2003's new features at http://www.microsoft.com/money/info/new.asp. To compare past versions of Money, visit http://www.microsoft.com/money/info/upgrading.asp.

Consumers must also choose among several configurations of Money. Standard is sufficient for users who simply balance checkbooks, budget, and pay bills online. If you track investments or do long-term financial planning, you'll want the Deluxe configuration. The Deluxe & Business and Money Suite packages are aimed mainly at small-business owners. Compare each Money 2003 configuration at Microsoft's Money 2003 Product Info page (http://www.microsoft.com/money/info/additional.asp).

Installation woes. There are a number of things that can cause installation problems. Some users get an error message that reads, "Please make sure you have 4095MB free on drive C." This is a program bug; close all applications, double-click My Computer, right-click the icon for the CD-ROM drive, and click Open to fix it. Then double-click Syspack.msi, double-click Setup.exe, and complete the installation.

If you already have a folder named Microsoft Money when you install Money 2001, you will get an Internal Error 2359 message. To resolve this, right-click Start and click Explore. Find the Microsoft Money folder, click it, press F2, type a new name for the folder, and press ENTER. Then install Money again.

If you use Windows Me and have trouble installing Money, click Start, Search, and For Files And Folders. Type **OEM*.INF** in the Search For Files Or Folders Named field and **C:\WINDOWS\INF** in the Look In field. Click Search Options, place a check mark in the Size checkbox, and choose At Most 1KB from the drop-down menu. Place a check mark in the Advanced Options checkbox and make sure the Search Subfolders checkbox is cleared. Click the View menu, Details, and Search Now. After the search is complete, click View, Arrange Icons, and By Size. This tracks down the zero-byte INF files, the likely cause of the installation problem. You'll need to delete these excess files. To do this, press and hold the SHIFT key while selecting all 0KB files. Right-click one of the highlighted files and click Delete. Once you've deleted the zero-byte INF files, attempt to install Money again.

After you install a new version of Money, it should convert your old data file automatically. If you don't see your data, however, you may need to manually import your old Money file. Simply open the File menu and click Open. Find and select your file in the dialog box and click Open. Money will automatically convert the file to the newly installed version of Money.

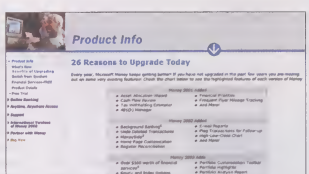
Make your own Money. To change Money's currency format setting, click Tools, Options, and the Currencies tab. From the list, choose the desired currency, click Set As Base Currency, and click Yes. Unless you are using Money 2003 on WinXP, you must also change your Control Panel settings. To do this, click the Start menu, select Settings, and click Control Panel (or, in WinXP, click Start and Control Panel). Next, double-click Regional Settings, and click the Currency tab (or, in WinXP, click Date, Time,

Quicken Backup Folders

This chart provides a quick reference to the default folders in which Quicken saves backup copies of your data files. For instance, you will find backups from Quicken 2001 in the Q01 folder.

OLDFILES	Data files from Quicken 4 or earlier
QW5	Quicken 5 data files
QW6	Quicken 6 data files
Q98	Quicken 98 data files
Q99	Quicken 99 data files
Q00	Quicken 2000 data files
Q01	Quicken 2001 data files
Q02	Quicken 2002 data files
Q03	Quicken 2003 data files

Language, and Regional Options and Regional And Language Options). Change the settings by choosing a Currency Symbol, Positive Currency Format, Negative Currency Format, Decimal Symbol, No. Of Digitals After Decimal, Digital Grouping Symbol, and No. Of Digits In Group from the drop-down menus. In WinXP, choose your country from the first drop-down menu. You can also use the Customize button and choose the desired options from the drop-down menus and click OK. After choosing the currency formats, click OK. The next time you start Money, it should correctly reflect your currency format preferences.

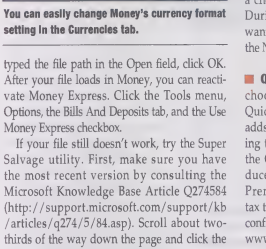


Microsoft's Web site includes a chart comparing the new features of each version of Money, beginning with Money 2001.

Transaction woes. If you get a This Transaction Cannot Be Entered error message, at least one file is missing or corrupted. Microsoft suggests that you first try to create a new file in Money. Click the File menu, New, and New File. Type **MsTest** in the File Name field and click OK. Set up a couple test accounts in the new Money file and try entering a new transaction.

If the MsTest file works correctly, click the Tools menu, Options, and the Bills And Deposits tab. Remove the check mark from the Use Money Express checkbox and click OK. Exit Money, and perform a Standard Level 2 Super Salvage repair on your original Money data file. Super Salvage is a utility built into Money that helps you restore and repair Money files. You should use the most recent version of Super Salvage rather than the one that came with your copy of Money, especially if you are using an older version of Money. You can download the most recent Salvage utility from the Microsoft.com Download Center (http://www.microsoft.com/downloads).

Click the Start button and Run. For Money 2000 and more recent versions of Money, type **"C:\Program Files\Microsoft Money\System \Msmoney.exe" –s "C:\My Documents\,** *the name of your file (including its .MNY extension),* and **"**. For instance, if the name of your file is MyFinances.mny, you would type **"C:\Program Files\Microsoft Money\System\Msmoney .exe" –s "C:\MyDocuments\MyFinances.mny"** (including quotation marks). If you use Money 99, you should instead type **"C:\Program Files\Microsoft Money\Msmoney.exe" –s "C:\My Documents\,** *the name of your file (including its .MNY extension),* and **"**. If your file is saved in a directory other than C:\My Documents, you will need to type the appropriate path to your Money data file. Once you have typed the file path in the Open field, click OK. After your file loads in Money, you can reactivate Money Express. Click the Tools menu, Options, the Bills And Deposits tab, and the Use Money Express checkbox.



You can easily change Money's currency format setting in the Currencies tab.

If your file still doesn't work, try the Super Salvage utility. First, make sure you have the most recent version by consulting the Microsoft Knowledge Base Article Q274584 (http://support.microsoft.com/support/kb/articles/q274/5/84.asp). Scroll about two-thirds of the way down the page and click the Download Salvage.exe Now link.

To start the utility, find and double-click the Microsoft Money program folder. Double-click the System folder and double-click Salv.exe (in Windows 98 or WinMe) or Salv (in WinXP). Click the first Browse button, find and click to highlight the corrupted Money data file, and click Open. Click the second Browse button. Type a name for the second salvaged copy of your file in the File Name field and click Save. Click Next, make sure Level 2 (Standard) is selected, click Next, and click Begin Repair. After Super Salvage completes its checks and repairs, double-click the new salvaged file. Try to add a new transaction. If it still does not work, you can uninstall and reinstall Money and try again. If this still doesn't work, you may need to create a new file and re-create the lost data.

Performance issues. If Money continually runs slower, too much data might be bogging down the program. Archiving old data helps Money run more efficiently. To do this, click File and Archive. Next, indicate for which date Money should begin archiving. Archived data is saved in a separate file and will no longer appear in your register while you are working with your Money data file. Click OK.

Put MoneySide aside. MoneySide appears in the left pane of Internet Explorer and gives you quick access to your register, upcoming bills, budgeting tools, and investment figures while browsing the Web. If you want to disable the MoneySide feature, click the MoneySide icon (a two-toned gray circle behind a white *M*) in IE. When the MoneySide page loads in the left pane, click MoneySide's Help menu and Settings. If you don't want MoneySide to open again in the current browsing session, place a check in the Close And Don't Open Again During This Session checkbox. If you don't want MoneySide to open in any session, click the Never radio button. Click Enter.

■ **Quicken Quandaries.** You will need to choose the version and configuration of Quicken that is right for you. Quicken 2003 adds several new features, such as downloading transactions from your bank directly into the Quicken register. This year, Intuit introduced a new configuration called Quicken Premier, which has more investment and tax tools than Deluxe or Standard. To compare configurations, go to Intuit's Web site (http://www.intuit.com), click the Quicken 2003 link under Product & Service News, and click Compare Products link (near the top right of the screen).

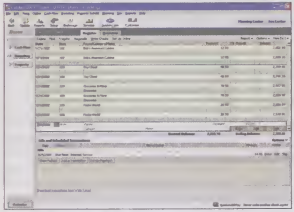
Installation problems. An Error 1305 message usually means Quicken cannot write to a specified file. The file name and path will appear in the error message. Locate the referenced file, right-click its icon, click Properties, remove the check mark from the Read-Only checkbox, and click OK.

Double payments. If, after downloading account information from your financial institution, two copies of each transaction exist, it is likely your financial institution recently moved

to the OFX (Open Financial eXchange) protocol, a special data format for banking files. You probably received one copy of the transaction from the bank's old protocol and one from the OFX protocol. Find the first transaction in a pair. Note its status in the Clr column (R, C, or blank). Delete the transaction (click it, press CTRL-D, and click Yes). Find the duplicate transaction and enter the correct status. Repeat this procedure for each doubled transaction. After the bank completes the OFX migration, this phenomenon should cease.

Corrupt data. If Quicken data is lost or damaged, you will likely get a Corrupt Data File error message. If you don't regularly back up your personal finance data, now is the time to start. Your financial information is too important to leave to chance. Both Quicken and Money make this easy by prompting you to make a backup copy each time you exit the program. This only takes a short time and protects your financial data. Assuming you have made a backup file, try to restore corrupted data by clicking File, and Restore Backup File. In the dialog box, locate the backup file and click OK. After Quicken restores the backup file, exit Quicken. Next, right-click Start and click Explore. Find the backup file, right-click it, and click Copy. Right-click a blank portion of the window containing the backup file, and click Paste. Press F2, type a new name for the extra copy and press ENTER. To check the backup copy, you can launch Quicken, click File, and Open.

If this doesn't correct the problem, use the Quicken Validate utility to check for errors. Open the File menu, click File Operations, and click Validate. Locate and click to highlight the copy of the damaged file and click OK. If you still have trouble, try using Quicken Super Validate. If you have Quicken 6 Release 1, you must first update to a newer release. To do this, click the Features menu, Online, and Quicken Live (Internet). Select Update My Quicken 6 and click Update Now. Super Validate works the same way as Validate, except you hold the CTRL-SHIFT keys while clicking File, File Operations, and Validate. If, after running Super Validate, you still can't restore your data, you will have to enter it by hand.



If you see two copies of each transaction you downloaded to your register, it is likely that your bank has recently adopted the OFX (Open Financial eXchange) protocol used for online banking files.

If you want to revert to an older version of Quicken because importing older files has corrupted data, uninstall the newer version of Quicken first. In Win98 and WinMe, click Start, Settings, and Control Panel. Then double-click Add/Remove Programs. Click Quicken, click the Add/Remove button, and click Yes. In WinXP, click Start, Control Panel, and Add Or Remove Programs. Click Quicken, click the Change/Remove button, and click Yes.

Reinstall the old version of Quicken using the installation CD or floppy diskette. After reinstalling Quicken, click File, and Restore Backup File. (For help locating the backup folder, see the "Quicken Backup Files" chart on page 66.)

Find the file you want to restore, click to highlight it, and click OK. You can then open it as you would any Quicken file, but you will have to re-enter any data you added in the newer version of Quicken.

Online error alerts. There are several common online banking errors: OL-202, OL-231, OL-232, OL-248, OL-249, and OL-297. Because the causes and remedies vary from one version of Quicken to the next and from one Windows OS to the next, we won't cover them all here. However, you can read about each error and the remedy for your system at Intuit's Quicken Support page for OL-Error Troubleshooting Instructions (http://www.intuit.com/support/quicken/ol_error_troubleshooting.html).

Problems or missing features. You can stay on top of most problems if you download the most recent updates for your version of Quicken. Users of Quicken 99 and newer can use the One Step Update feature. Click the Finance menu and One Step Update. Click to remove each check mark from each checkbox in the resulting dialog box. Then click Update Now. If Quicken indicates that an update is available for download, click Continue, Update Now, and Next. A wizard walks you through the updating process.

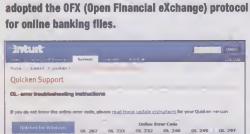
You can also access the releases through the Quicken Updates page (http://www.intuit.com/support/quicken/updates/index.html). After selecting your version of Quicken, click the Manual Update link on the next page.

Budgeting. Before you can create an Automatic Budget in Quicken, you'll have to use Quicken for a few months first. Quicken's Automatic budgeting feature uses historical spending data rather than Automated Bills data. If you have trouble with this feature, make sure you have selected a range of dates for which you have entered all transactions.

Window resizing. If you can't resize the Quicken Window, exit all programs and restart Quicken. Windows that won't resize often indicate that your computer has low resources. In other words, too many programs are running. Your Quicken data file may also be too large. To reduce the size of your data file, you can create a new file with only the current year's data. Click File, File Operations, Year-end Copy, the Start New Year radio button, and click OK. In the Start New Year dialog box, click OK. Quicken stores past years' information in a separate file that won't hog your system resources while you use Quicken for current financial matters.

■ **Reconciled Accounts.** Remember to create backup files often and to visit the company's Web site periodically for updates. Staying on top of any known problems with your personal finance software can help you keep your finances in order. LS

by Kylee Dickey



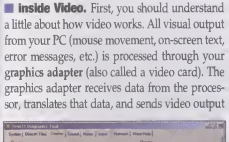
Intuit's Web site has a chart with links to remedies for each of the Online Error messages you might encounter in Quicken 99 through Quicken 2002.

Get The Picture?

How To Fix Common PC Video Problems

PC video is your canary in the mine—an early warning system. Peripheral problems, device driver conflicts, ailing applications, and dying drives all provide visual clues that something is wrong. But what are the signs that video itself is ailing? How do you tell when the canary is sick? And how do you find a cure? If you are experiencing any of the problems listed below, display problems are the most likely culprit. And just like a good vet, we'll do more than tell you what's wrong; we'll help you nurse your canary back to health.

■ **Inside Video.** First, you should understand a little about how video works. All visual output from your PC (mouse movement, on-screen text, error messages, etc.) is processed through your graphics adapter (also called a video card). The graphics adapter receives data from the processor, translates that data, and sends video output to the monitor via a monitor cable, sometimes called a VGA (Video Graphics Array) cable. The monitor then updates its display as per the graphics adapter's instructions. There are several potential points of failure here. If the video card isn't communicating with the motherboard and processor, it can't receive accurate data. If the video card is malfunctioning, it may not process that data correctly. If the connection to the monitor is bad, the video card's instructions may get lost in transit. And if the monitor itself is acting up, it won't be able to properly render those instructions. In addition, you have device drivers (programs that let your OS [operating system] communicate with your hardware) for both the graphics adapter and monitor. If these crucial pieces of software aren't doing their jobs, the physical state of your hardware is moot.



Microsoft's DirectX Diagnostic Tool helps you troubleshoot video problems related to games and other multimedia applications.

But with a little troubleshooting and a few educated guesses, you usually won't have much trouble identifying your problem. Fixes range from reconnecting cables to adjusting your Windows settings. And sometimes the only solution is to get a new canary. As always in technology, start with the simplest possible solution and work from there. We will assume for each of these common issues that you already covered the basics: checked for power, disconnected and reconnected cables, and rebooted your PC. These three steps will fix a surprising percentage of problems. If not, though, check out these solutions to common video troubles.

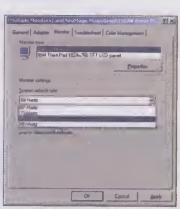
■ **No Video Display; A Completely Blank Monitor.** The first thing to do if you're getting no picture whatsoever is to tackle the obvious. Check to make sure you're getting power. Most monitors have an LED (light-emitting diode) power indicator, and you can usually hear a low electric buzzing or call up the monitor's built-in settings menu. Also, check the connections between the monitor and the back of your PC. Sometimes brightness and contrast get out of whack, so fiddle with the knobs on your monitor. If your monitor can't get power, take it in for repair or replace it. Whatever you do, don't open the monitor or you could be in for the shock of your life—literally.

If the monitor is getting power, everything is connected fine, and it isn't a matter of monitor settings, the signal from the video card isn't getting through. Does the machine appear to be booting up normally? If so, you have video card problems. Try reseating the video card (see the instructions for this procedure below) and then, if necessary, replace it. If you aren't getting a standard boot sequence, you may have a problem completely unrelated to video. Most PCs emit a single beep when going through their normal startup routines. Any beeps outside of the ordinary indicate trouble. Check your motherboard or PC's documentation for a list of explanations of your PC's BIOS (Basic Input/Output System) beep codes.

■ **Flickering Or Rolling Screen.** If your monitor displays a picture but it flickers or rolls continuously, adjust your monitor settings. A CRT (cathode-ray tube) monitor works by utilizing an electron gun that "paints" the back of your screen with subatomic particles, causing pixels (picture elements, or the smallest part of an image that a computer screen can control) to glow in various colors. If your screen flickers or rolls, it can mean that something is wrong with this painting process.

Check your monitor's hardware controls; some even have television-like vertical hold

knobs. You may need to adjust Windows' **refresh rate**, or the speed at which your monitor repaints the screen. A rate below 75Hz (equivalent to 75 refreshes per second) will cause a noticeable flicker. Higher rates, however, use more system resources. Set your machine to the lowest rate at which you don't experience scrolling or eyestrain. For most monitors, you control the refresh rate from the Display Properties dialog box. Choose Display from the Control Panel or just right-click your Windows Desktop and select Properties. Select the Settings tab, click the Advanced button, and navigate to the Monitor tab.



Your monitor's refresh rate determines how often the monitor redraws on-screen items, including text and graphics. Too slow a rate will result in a "scrolling" effect.

If there isn't a place to adjust your refresh rate, you may simply need to update your monitor's drivers (especially if it's listed as a generic monitor type). Run any software that came with your monitor, or visit the manufacturer's Web site to find drivers. If you have a very old monitor, you may not be able to adjust the refresh rate at all. In that case, it may be time to go shopping.

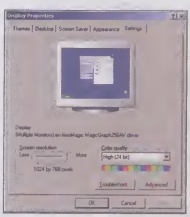
Strong electrical fields can also interfere with CRT monitors, so avoid setting up too close to power lines or electrical fans and move your speakers (some of which use unshielded magnets) away from your monitor.

■ **On-Screen Spots Or "Snow."** If random spots, snow, or other distortions mar your otherwise perfect display, you either have a bad monitor connection or video card problems. First, disconnect and reconnect the cable connecting your monitor from the PC. Look for broken or bent pins in the connector.

If the connection isn't the culprit, first update the video card drivers. From your Control Panel, choose System (or right-click My Computer and select Properties). Click the Hardware tab and open the Device Manager. Find your Display Adapter on the list, right-click it, and choose Properties. Under the Driver tab, look for any problems with the driver and make sure you have the correct driver for your device. Then click the Update Driver button to search for new software. You may also want to check the manufacturer's Web site for new drivers on occasion.

If a driver update and reboot don't clear up your screen, open the PC case to get directly at your graphics adapter. If you have an onboard graphics adapter (soldered onto the motherboard), there is little you can do with it. Replacing the motherboard or buying an add-in video card are about your only options. If you have a removable video card, remove and reseat it carefully. If that doesn't work, and if you have a PCI (Peripheral Component Interconnect) card and a spare slot, try moving it to another position. If all else fails, replace the card.

■ **Type That Is Too Small Or Too Large.** If you find yourself scrolling endlessly through Web pages or pulling out your magnifying glass to read spreadsheets at work, you may want to adjust your screen's resolution. It may seem counterintuitive, but too large text and images stem from too low a screen resolution, and vice versa. That's because resolution refers to the number of pixels displayed on your screen (the higher the resolution, the more pixels displayed). But because your physical screen real estate is more or less fixed, a higher resolution (with more pixels) means that each of those pixels needs to be smaller. Hence, small type and tiny icons result from high resolutions.



You can adjust your screen resolution to make on-screen text and images appear smaller or larger.

In order to adjust your resolution, access the Display Properties dialog box by right-clicking your Windows Desktop. Under the Settings tab, adjust your screen resolution to a setting that is both easy on your eyes and maximizes your on-screen real estate. In addition, monitor controls often let you adjust total screen space, as well, expanding or contracting the display area to minimize dark space at the edges of the monitor screen.

■ **Video Slowdown & Frequent Crashes.** A sluggish or unstable machine generally has more of a workload than its resources can handle. This problem will become especially apparent when you try to run graphics- or resource-intensive applications, such as games, image editors, or multimedia browser plug-ins. You may be able to avoid upgrading your hardware by adjusting system settings.

First, try turning off fancy Windows effects, such as fade-in menus and animated icons. In Windows XP, access your System Properties by right-clicking My Computer and selecting Properties. Choose the Advanced tab and click the Settings button in the Performance section. Under Visual Effects, manually disable specific options or simply select the Adjust For Best Performance radio button. If you're having trouble with other programs, try turning down Windows' graphics acceleration. From the Display Properties dialog box, select Advanced under the Settings tab. In the Troubleshooting tab (or the Performance tab for older Windows versions), move the acceleration slider to the highest level at which your PC runs acceptably.

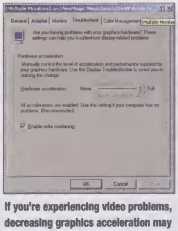
In the end, though, downgrading video acceleration may disable some of the very programs for which you want improved performance. In that case, you need to upgrade. System memory (or RAM) is a cost-effective and easy upgrade path. If that doesn't work, however, you need to purchase a new graphics card. Modern video cards have dedicated video memory and specialized graphics processors in order to provide more power to video applications and save system resources for other tasks. Get the most dedicated graphics memory you can afford.

■ **Games Play Poorly Or Not At All.** As games become more advanced, they demand more of your PC. First, make sure that your machine meets (at least) the minimum and (ideally) the recommended specifications for the game in question. If you don't meet these specs, you need to either upgrade your computer or find a new game to play. If you meet the specs but are still looking for improved performance, you do have a few tricks available. DirectX is a set of standard APIs (application program interfaces) that hardware and software manufacturers can develop in order to improve interoperability and game play. Sometimes a simple upgrade of DirectX http://www.microsoft.com/windows/directx)

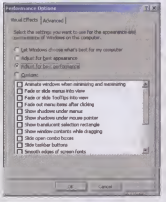
will significantly improve game performance by itself. Microsoft also provides a diagnostic tool for DirectX. From your Start menu, select the Run option, type **dxdiag**, and press ENTER or click OK. The DirectX Diagnostic Tool will help you identify and resolve any video issues with drivers, compatibility, and system settings.

■ **After Installing New Components, Video Doesn't Work Properly.** Sometimes new hardware or software can interfere with your video card's settings and resources. If you just put in a new sound card or other hardware device, your PC may have diverted resources previously dedicated to video and reassigned them elsewhere. If you updated drivers for your motherboard or other components, they may be conflicting with your video card or monitor drivers. If your PC can no longer recognize or use your graphics adapter, your machine will boot into Windows Safe Mode with limited video capability. Access your Windows XP Device Manager from the Hardware tab of the System Properties dialog box (or the Device Manager tab in earlier Windows versions) and check to see if Windows recognizes your Display Adapters and Monitors drivers and whether they are working properly.

You may need to roll back to your previous configuration, uninstalling the new device or drivers. Delete new hardware from your Device Manager (right-click the item and select Uninstall), shut down, and physically remove the device. WinXP also provides tools for reinstating previous system settings. To roll back drivers for a particular component, select the item from the Device Manager, choose Properties, select the Driver tab, and click Roll Back Driver. WinXP and Windows Me also provide more complete System Restore tools that will let you roll your entire system back to a previous restore point. To run System Restore in WinXP, open Help And Support from your Start menu. Choose the Performance And Maintenance category on the left, click Using System Restore To Undo Changes, and then select Run The System Restore Wizard from the bottom. WinMe users can click Start, Help, and the Use System Restore link beneath Fix A Problem. Check with the manufacturers of your video card and any conflicting components to ensure device and driver compatibility.



If you're experiencing video problems, decreasing graphics acceleration may provide some relief.



Windows XP's visual effects are nice eye candy, but they also drain system resources and can slow down your display.

■ **Slow-Loading Web Images & Poor Video Playback.** Most of the time, slow multimedia downloads are simply a result of a slow Internet connection. Even if you surf on a cable or DSL (Digital Subscriber Line) connection, general Internet traffic and network congestion will occasionally slow you to a maddening crawl. However, there are a few ways to speed things up.

First, make sure you're caching properly. Your browser cache stores images and other files locally for faster access if you need them again. It won't help much as you go from site to site, but it can make pages within the same site load more quickly. Click Internet Explorer's Tools menu and then Internet Options. Click Settings in the Temporary Internet Files section of the General tab and select the Automatically radio button in the Check For Newer Versions Of Stored Pages section in the Settings dialog box. Also make sure that you have a reasonable amount of hard drive space (between 32MB and 64MB) allocated to your Temporary Internet Files Folder. Less won't give you enough room to store files and more can actually slow you down.

You can allocate cache space in Netscape by clicking Edit and Preferences. When given the option, select a lower-resolution image or video file to download. And if you want to view high-res video, save the file first (right-click the link to the file and select Save Target As) and watch it locally. You'll have to wait for it to download, but it should play much more smoothly.

■ **PC With A View.** Your PC's video is a helpful guide to the health and performance of your system. And if the display isn't working, nothing else is much use at all. You can't afford to have a sick canary. These fixes will get your video flying again so you can continue to mine the depths of your PC's capabilities. LS

by Gregory Anderson

Notebook Display Problems

Though notebook computers share many video problems with their desktop counterparts, they also have a subset of display issues all their own.

LCD (liquid-crystal display) screens. Because notebooks use LCD screens rather than CRT (cathode-ray tube) monitors, they have different kinds of monitor problems. LCD screens are made of flexible layers of glass and crystals, which glow when electricity passes through them. As a result, LCD displays are more costly to repair and replace. LCDs can suffer from dead pixels (blank or discolored spots on the screen), false colors (crystals render color differently than a CRT's phosphors), and uneven lighting. All of these require professional repair.

Less flexible resolution. LCDs normally contain a set number of pixels. Changing screen resolution on an LCD monitor will often result in distorted graphics and poor image quality. Whenever possible, leave your notebook computer set to its default resolution.

External display compatibility. One of the main benefits of notebook computers is their portability. As a result, many people use notebooks with a variety of external monitors and projectors. Normally, your notebook should recognize an external display at startup and prompt you to install the necessary drivers. For most multimedia projectors, you can get away with simply treating them as generic Windows Default Monitors. However, you may need to adjust screen resolution or color settings in order to maximize video quality. Make sure to give yourself enough time for setup and (possibly) driver installation when hooking your notebook up to an external display. ■

The Day The Music Died

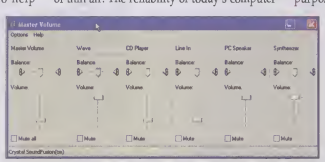
Troubleshoot Your Audio Issues

Today's personal computers are a far cry from their stodgy ancestors that sported tinny-sounding speakers and mono channel audio. Boasting audio performance that can rival some home stereo systems, modern home computers are finally fulfilling industry predictions of their role as multimedia hubs for the home. Yet despite the progress computer makers made in adding new audio features, problems can crop up at the most inopportune times. If your computer can't carry a tune, read on and we will provide you with some tips to help restore high fidelity to your computing experience.

Solving audio problems on personal computers is a task that requires a little patience, a bit of stubbornness, and most importantly, a plan. Although each problem you face with your computer may be unique, you'll find that using consistent troubleshooting methods will pay handsome dividends. Also, the strategies you use to resolve your audio problems will be valuable in other aspects of supporting your computer. We'll review how computer audio actually works, discuss some common troubleshooting strategies, and put them to the test in three scenarios.

First Steps. Troubleshooting is often more of an art than a learned skill. However, divining what ails your computer can make even the most creative types pull out their hair in frustration. A good rule of thumb in any troubleshooting exercise is to remember Occam's Razor, whereby the simpler of two competing theories is the most preferable. Our other guiding principle is KISS (Keep It Simple, Stupid). When trying to correct a problem, you only want to change one element at a time. Otherwise, you risk losing track of the changes you make and exacerbating the problem. A corollary to this is distilling the problem from "My sound is gone!" to "I can't hear audio CDs when I play them in my computer." By narrowing the problem down to its core, you'll also eliminate possible courses of action, thereby simplifying your strategy.

Before we delve into our sample problems, there's one idea we'd like to reinforce. In our experience, it is rare for audio problems (or computer problems in general) to appear out of thin air. The reliability of today's computer hardware has improved dramatically over the last few years, as has the stability of the latest versions of Microsoft Windows.



Controlling the sound level and balance for your audio devices is easy thanks to Windows' the Master Volume control, which you'll find by clicking the speaker icon in your System Tray.

When things go amiss, it's usually because some aspect of your computer has changed, whether it's the installation of a new program, adding a new piece of hardware to your system, or moving your system to a new location.

Although you may encounter a vast array of audio difficulties, the type and scope boil down to three general areas: hardware problems, software problems, and user error. We'll examine strategies for coping with each of these, with an eye on preventing future problems. After all, our goal is to treat the disease, not the symptoms.

Perhaps the most important element in successfully troubleshooting audio problems is understanding how computers reproduce the wide array of sounds we have grown accustomed to hearing.

Computer Audio In A Nutshell. For our purposes, the easiest way to understand computer audio is to take a look at the elements that our computers use to deliver sound. Unlike traditional home stereos that used analog formats to capture and render sound, today's computers deal with sound in a completely digital manner. Put simply, this means that your favorite Bach CD stores music using a series of 1s and 0s. When you put the CD into your PC's CD drive, a small laser inside scans the CD for patterns among these 1s and 0s that represent various aspects of the underlying music. Circuitry in the CD drive then translates these patterns into an electrical signal that your computer hardware can understand.

Next, a software program known as a **driver** coordinates how your computer accesses its CD drive. Each hardware component in your computer relies upon these drivers to provide a bridge between the physical world of computers and the logical world of OSes (operating systems). In our example, the CD driver tells our OS how to handle the electrical information retrieved from our Bach CD.

Sound card. Once the OS has our Bach concerto in digital format, it has to choose an output device. This is usually a sound card with jacks for speakers and headphones. The OS utilizes the sound card's driver and sends our digitized concerto to the sound card.

In a case like this, start by prioritizing your actions, looking to eliminate the most probable causes. This is referred to as "plucking the low-hanging fruit."

When the sound card receives our concerto in digital format, it uses a DAC (digital-to-analog converter) to convert the music to analog, or waveform format. Circuitry in the sound card amplifies this analog format into electrical impulses. This amplified signal is then sent out the appropriate jack, in our case to our speakers.

Speakers. As the signal arrives at our speakers, two magnets in the speaker convert the electrical energy into acoustic energy by vibrating speaker elements. The permanent magnet is like any simple magnet you might have played with as a child. Its job is to serve as a base for an electromagnet to push against. As the electrical impulse from your sound card arrives at the speaker, it causes the electromagnet in the speaker to push away from the permanent magnet. In doing so, it also moves a component known as a diaphragm. Most diaphragms are made of a paper composite that has the ability to flex as the electromagnet moves the diaphragm. As the two magnets oscillate this diaphragm, it vibrates the air in front of the speaker, creating sound waves. Depending on their strength, these sound waves reach our ears and we hear a Bach concerto.

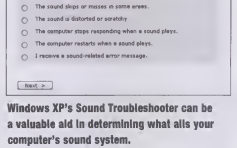
Although our example is specific to how our PC plays a Bach CD, it isn't too difficult to extend it to other forms of computer audio, such as MP3 files, computer games with sound effects, or even the system sounds associated with such normal events as starting a PC. Focus on input and output hardware, their associated software drivers, and the OS that coordinates their use.

Sample Scenarios

To put all this theory to work, we've come up with three scenarios that will help you play the role of audio detective. Our examples won't necessarily match the real-world problems you may encounter, but the procedures we outline for each will serve you well if your system decides not to stay in tune. Our first scenario involves a computer system that won't play any sound at all. In the second scenario, you've upgraded the sound card in our system but still can't hear any sound. Finally, in our third scenario, you've given an older computer to a family member and she can't seem to get the sound working.

Scenario 1: The Sound Of Silence.

The computer in our first scenario was a top-of-the-line PC two years ago, featuring a 500MHz Pentium III processor and 128MB of RAM. Though it's a bit long in the tooth compared to today's speed demons, it's still a serviceable computer and with an OS update should be able to soldier on for another year or so. We recently upgraded it to Windows XP Professional and thought everything was OK until we tried to play a music CD. Time to roll up our sleeves and start investigating.


Sound Troubleshooter
What problem are you having?
I do not hear sound from my computer's speakers or headphones.
A sound appears to play, but I do not hear anything.
A sound plays, but then stops suddenly.
The sound skips or pauses in some areas.
The sound is distorted or scratchy.
The computer stops responding when a sound plays.
The computer restarts when a sound plays.
I receive a sound-related error message.
Next >

Windows XP's Sound Troubleshooter can be a valuable aid in determining what ails your computer's sound system.

In a case like this, start by prioritizing your actions, looking to eliminate the most probable causes. This is referred to as "plucking the low-hanging fruit." It doesn't make much sense to tear a system apart if the problem is as simple as the mute setting on Windows' Volume Control panel. If you're unsuccessful with the quick-and-dirty approach, you'll need to take a deeper look at both the hardware and software that may be affecting our PC's audio.

Step 1. We began our investigation by checking to see if our speakers were properly connected to your sound card. Speaker wires are easy to accidentally pull out, so we checked to make sure our speaker plug is properly seated in the speaker jack of our PC's sound card. Although most of today's sound cards have the connections color-coded to assist you, many older sound cards don't give you very good visual cues about which jack to plug your speakers into. If your speakers are self-powered (equipped with an AC [alternating current] adapter), check to see if the adapter is properly connected to your speakers and plugged into a wall outlet.

It's also wise to make sure that no headphones are plugged into the headphone jack on your speakers. Plugging a pair of headphones into most speakers will disable the speaker and route the sound to only the headphones. If you're using headphones instead of speakers, make sure they're properly plugged into the headphone jack on your sound card. Also, make sure that the power button is on and the volume control on your speakers is set at an appropriate level. If this solves your problem, count yourself lucky. If it doesn't, it's time to take a look at the system settings for Windows XP.

Step 2. Head for Windows' volume control settings. Although there are many ways to access this feature, the easiest is to click the speaker icon in the System Tray (the box on the right end of Windows' Taskbar where the clock resides). If your System Tray contains several icons, you may have to click the expander button to reveal the speaker icon. A quick glance at the Master Volume display revealed a variety of controls for controlling the volume and balance on our computer's sound devices. The usual culprits here are a check mark in the Mute All checkbox or having the Master Volume slider pushed all the way down.

Our volume controls were properly configured, so we were forced to re-evaluate our strategy. The volume control check above assumed that the CD we were trying to listen to was playable. We checked our CD's functionality by putting the CD into our stereo CD player. It played normally, so we chose a second CD from our music collection and tried it out on our computer. The second CD failed to play properly, as well, so we had eliminated another possibility. If you see the activity light on the CD drive illuminate when you insert a CD, you can be pretty confident that

the drive itself is functioning normally. Sometimes CDs can become too damaged to play, although in our test scenario, this wasn't the case.

Note that CD-Rs (CD-recordables) and CD-RWs (CD-rewriteables) are another concern. Not all CD drives support CD-R and CD-RW media. Additionally, in an attempt to stem music piracy, some music companies are releasing music CDs that won't play in CD-ROM drives at all.

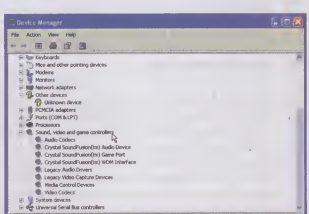
You can access the Sounds And Audio Devices Properties dialog box from the Control Panel.

Step 3. Our next step was to make sure that Windows was properly configured to use the audio devices installed in our computer. From the Control Panel, we clicked Sounds And Audio Devices to access our device properties. There are five tabs to choose from: Volume, Sounds, Audio, Voice, and Hardware. We clicked the Volume tab to make sure that the Mute checkbox was clear and the Device volume slider wasn't set to Low. Next, we moved to the Sounds tab, where we checked to see whether our system could play standard sounds associated with Windows program events.

To test your system sounds, select the Start Windows entry in the Program Events section. Below this section are a Play button and a drop-down menu for selecting an alternate WAV (the standard Windows audio format) file. Click the Play button and see if Windows responds. If you are the sound of silence still greets you, move on to the next step.

Step 4. Next, we checked to see whether Windows was properly configured to use our sound card. We launched Device Manager by clicking Start, Control Panel, Performance And Maintenance, and System. In the System Properties dialog box, we clicked the Hardware tab and the Device Manager button. Then we clicked Sound, Video And Game Controllers. Windows presented a list of the multimedia devices on our system (in our scenario, the sound card is a Crystal SoundFusion Audio device). A prominent, red X appeared over the icon next to our sound card, and we knew we had a problem. We double-clicked this icon to bring up the device's Properties dialog box.

In our test scenario, the Properties dialog box exposed the culprit. The box's Device Status area showed that our sound card was disabled, possibly during our upgrade to WinXP. In the status window, WinXP gave us instructions on how to enable the device. Clicking the Enable Device button brought up the Device Problems Troubleshooting Wizard. In addition to asking if you want to enable the device, it also offers an explanation as to why your sound card might have been disabled. In our scenario, clicking Next successfully enabled the sound card. We clicked Finish and closed the Device Manager. Now when we played our Bach concerto, we were catapulted into the midst of a symphony.



Device Manager lets you configure your computer's hardware, update drivers, or disable a recalcitrant component.

■ **Scenario 2: Out With The Old, In With The New.** Our next scenario involves a problem we encountered when upgrading the sound card in our Dell Dimension desktop. Our computer had a DVD-ROM drive with an integrated (embedded in the motherboard) sound card, but we wanted to add a sound card that supported the new 5.1 channel sound required for the best playback of audio in DVDs. After selecting SoundBlaster's Audigy Platinum, we carefully installed the card according to SoundBlaster's instructions. When we rebooted our computer, WinXP recognized the new piece of hardware and prompted us for the CD containing the latest drivers for the sound card. We dutifully inserted the CD and found that WinXP had newer drivers than the ones on the CD. We decided to use WinXP's drivers and check SoundBlaster's Web site (http://www.soundblaster.com) at a later time to see if newer drivers were available.

Next we inserted our "Lord Of The Rings" DVD, dimmed the lights, and clicked our DVD software's Play button. Ouch. Although we could hear the film's soundtrack, it wasn't nearly as lush as we had expected. Though our system isn't intended to serve as a full-blown home theater, we needed to resolve this issue. Back came the lights, and we began to scratch our heads about what might have gone wrong.

Step 1. A quick review of our physical connections didn't reveal any loose speaker cables or improperly connected devices. A check of our DVD program showed that we had properly selected Dolby 5.1 for our sound playback and the volume in the program was set correctly. Our copy of "Lord Of The Rings" supports the Dolby Digital and DTS (Digital Theater Sound) formats. We quickly ran through the steps outlined in our first scenario, with no luck.

Step 2. At this point, we decided to double-check our choice in sound cards. SoundBlaster is known for being the dominant sound card manufacturer, but sometimes problems crop up with the best-made devices. Our first goal was to make sure that our sound card was compatible with WinXP Pro, and that there were no known issues that might be causing our troubles. According to SoundBlaster, our card was fully supported under Windows XP, but to be sure, we decided to head to Microsoft's Web site for the definitive answer. Microsoft maintains an online Hardware Compatibility database (http://www.microsoft.com/hwdq/hcl) that lists all the hardware components that the company has certified as compatible with the various flavors of Windows. The database showed that WinXP supports our Audigy Platinum card, so we decided that we had reached a dead end.

Step 3. Our last hope was to use WinXP's built-in Sound Troubleshooter. As Windows has matured, its embedded wizards and

An important thing to remember is that computers are just machines designed to do our bidding.

Physical connections are one of the likelier trouble spots, but usually the easiest to fix.

troubleshooters have become easier to use and more informative. If you find yourself stumped over a computer problem, don't hesitate to try out WinXP's Help And Support Center. You can launch the Center by clicking Start and selecting Help And Support. Next, click Fixing A Problem under the Pick A Help Topic heading, click List Of Troubleshooters, and then click Sound in the list that appears in the right pane. This feature works by asking you to describe the problems you're experiencing, narrowing down the potential causes, and offering you methods to test your system. After answering several inquiries, the Troubleshooter was unable to solve our problem.

Step 4. Temporarily stumped, we turned to the manual that had accompanied our sound card. Although we had read the pertinent sections on installing the card, in our haste, we really hadn't paid much attention to the other sections. To our surprise, we realized that our poor sound quality was due to our speaker setup. Proper reproduction of our DVD's soundtrack requires what's known as a 5.1-channel speaker package. This package comprises six speakers: two front speakers, two rear speakers, a center channel speaker, and a subwoofer. Trying to pump this much sound through our two-channel speaker setup was asking too much. After reading a few online reviews, we placed an order for Klipsch's (http://www.klipsch.com) ProMedia 5.1 Personal Audio System. When the system arrived, we carefully read the accompanying manual before connecting the speakers to our sound card. With bated breath, we dimmed the lights and retreated for two hours to the sights and sounds of Middle Earth.

■ **Scenario 3: Tone-Deaf Hand-Me-Down.** Our last scenario involves a computer that we gave to a relative with the promise that it was as good as new. Before we packed it up and sent it to her, we tested the system and, indeed, it worked as advertised. Unfortunately for us, by the time our relative tried to play a game on the system, the sound was MIA.

Now that you've walked through two troubleshooting sessions, a scenario like this should be relatively easy. The first clue that focused our investigation was that nothing had changed on the system, save its location. Our relative hadn't installed any new software (the game was already installed) or any new hardware. On a hunch, we had her open up the side panel to the computer and look inside the case. Sure enough, the sound card had come loose from its PCI slot during shipping. Although PCI slots usually do a good job of gripping the peripherals you store in them, enough of the contacts on the card had shifted to disable the sound card. We walked her through reinserting the card, and the sound on her system returned following an uneventful reboot.

An important thing to remember is that computers are just machines designed to do our bidding. When a problem seems inscrutable, take a deep breath and focus on the clues that describe the problem.

■ **A Sound Investment.** In addition to the steps we've outlined in this article, there are numerous additional resources to help you in troubleshooting your sometimes wayward computer. If you have access to the Internet, using one of the many search engines, such as Google (http://www.google.com) and Yahoo! (http://www.yahoo.com), can provide insight into your problems. One area of Google that is particularly helpful is its newsgroup archive. Here you'll find a wealth of information from fellow computer users. To access the archives, simply click the Group tab, enter the keywords describing the problem you're facing, and select Google Search. *Smart Computing* subscribers can also visit the Smart Computing Web site's (http://www.smartcomputing.com) Q&A Board for user-provided advice. If you suspect the problem is hardware-related, don't forget to check the manufacturer's Web site. Finally, Microsoft has an excellent Knowledge Base (http://support.microsoft.com) where you can query Microsoft's extensive database of issues and bugs. LS

by Chris Jackson

Digital Camera Crises

Deal With Digicam Troubles

A few years ago, digital cameras were novelties left to the professional photographer or computer techie who had a few extra thousand dollars to burn. And for those who did spend the money, the images the early digital cameras produced were marginal in quality, at best. Sure, they looked fine on a Web page or when viewed as an email attachment, but printing anything larger than a 4- x 5-inch print was an exercise in disappointment.

Not so anymore. Modern digital cameras, even inexpensive ones, produce images that look great displayed on your monitor or printed with your inkjet. They offer automatic controls that let the novice photographer point and shoot, as well as sophisticated manual controls that appease even the professional.

But just because digital cameras have dramatically improved and are easier to use doesn't mean you won't have problems. Digital cameras introduce their own unique style of headaches and frustrations. In this article, we'll explain some of those problems and provide hints on what to do about them.

Before The Trouble Starts. To begin, we have a few suggestions that might help you avoid problems before they start. First, read the camera manual from cover to cover to get a basic idea of how the camera works and what it can do. You can solve many everyday problems by following your manual's instructions, and a quick read-through lets you know what information is there.

Second, visit the support section of the manufacturer's Web site for FAQs (frequently asked questions) about your camera model. Many sites also include troubleshooting tips and message boards where you can read the questions and experiences of other camera users. And while you are at the manufacturer's site, check for the latest software and firmware updates.

Third, make sure you thoroughly read and understand your camera's warranty, including what is covered, when the warranty expires, and where to take your camera if it needs service. Knowing this information up front will save you support headaches later.

Battery Drain Issues. Unlike most regular film cameras, digital cameras are power-hungry devices that quickly consume batteries in a few picture-taking sessions. This quick battery drain can sometimes appear as a camera problem, when in fact it's just a characteristic of the device. Here are a few suggestions in combating digital camera battery drain.

Don't use plain alkaline batteries. Alkalines are good at providing a low, steady trickle of electrical current over a long period, such as when powering a flashlight or radio. They are less suited for the bursts of energy a digital camera needs to auto-focus, fire the flash, and process digital images internally.

Use your camera's AC adapter when transferring files. This saves battery life and prevents sudden power losses from damaging your pictures.

Instead of alkaline batteries, use rechargeable NiMH (nickel-metal hydride) or Li-Ion (lithium-ion) batteries, both of which do a better job at providing energy bursts.

Turn off the LCD (liquid-crystal display). One of the biggest drains on your camera batteries is the LCD. Instead of leaving it on, turn it off when you're not using it.

Turn off the camera between shots. Each time there is a significant pause in shooting, turn off the camera. There is nearly always a short delay each time you turn on your camera's power, but giving your batteries a rest between uses will greatly extend their life.

Don't use battery power during image transfers. Use the AC power adapter when you connect the camera to your computer to transfer images. This prolongs battery life and protects you from a power failure during the transfer that can damage your images.

Protect your batteries from the cold. Batteries work through a series of chemical reactions that cold temperatures can hamper. In some cases, batteries that would normally last for an hour quit after 10 or 20 minutes in cold environments. To prevent this, keep your camera and spare batteries warm by placing them next to your body. Also remember that Li-Ion batteries do better in cold weather than NiMH batteries.

With many auto-focus digital cameras, pressing the shutter release halfway activates the focus feature. To take a picture, you must then continue to press the release down completely.

If you press the shutter release when your camera is on and nothing seems to happen, make sure the camera is in capture mode, not in transfer or playback mode.

■ **Camera Lockups.** Your digital camera may occasionally refuse to come on, display an error message in the display panel, or lock up for no apparent reason. When such problems occur, there are a few things to check and do before you call tech support.

The camera displays an error message and locks up. First, reset the camera by removing the camera batteries for 15 minutes, replacing them, and turning the camera back on. If the camera still locks, replace the batteries with a fresh set and try again.

If you still have problems, check the manufacturer's Web site for a firmware update. Most companies make the updates freely available through download and supply directions on how to install their updates either at the site or as a README file included with the download.

If you do call tech support, make sure you have notes on what error message appeared and at what point the camera locks. These are two key questions the tech support representative will ask.

The camera gets hot and locks up. NiMH and Li-Ion batteries give off more heat than conventional alkaline batteries, and with certain models, the heat from the battery compartment can interfere with the camera's circuitry. This is especially true when you take a large number of pictures over a short period of time. Removing the batteries for 15 to 20 minutes resets the camera and cools the batteries.

■ **Media Card Troubles.** Most digital cameras store the pictures you've taken as files on removable media cards that use flash memory technology. There are three rival card formats: CompactFlash, SmartMedia, and Sony's Memory Stick. Regardless of what your camera uses, there are a few problems you might run into.

The "card not initialized" error appears in the display panel. You have to format media cards, like any other storage device, before you can use them. When the "card not initialized" error appears, the media card needs formatting. Use the format feature on your camera to do this.

If you have a card reader, avoid formatting the media card with the Windows format option. Windows normally formats storage devices, such as floppy diskettes, using FAT32 (32-bit file allocation table). Your camera can only use media cards formatted using FAT16 (16-bit file allocation table). Unless you specifically specify FAT16 when formatting a media card, you'll get FAT32.

Your camera won't recognize your SmartMedia storage card. SmartMedia cards contain a special information area called a CIS (Card Information Structure) header. If this structure is damaged, the camera doesn't recognize the card. This commonly occurs when you have used the media card in another device, such as an MP3 player, that reformats the card for its own needs.

Some SmartMedia card readers come with a utility program, called Smprep.exe, which repairs the CIS header and reformats the card so your camera can recognize it. If you don't have a card reader, you may want to purchase one just to get this program. You can also find this program on some camera and media manufacturer Web sites.

Your media card doesn't hold many pictures. The number of pictures your media card can hold depends on the card's capacity, your camera's image resolution setting, and the image quality setting. With the price of media cards dropping, your best bet to get more pictures on a card is to purchase one with a larger capacity.

Another way to increase the card capacity is to decrease the size of the image file. You can do this by lowering the camera resolution setting, lowering the picture quality setting, or both. The images you get will be lower quality, but will usually be acceptable for on-screen viewing and sending through email. On the other hand, lowering resolution and quality is not a good option if you plan on printing your images.

Finally, if you take pictures and find you can only get two or three on your media card, check to see if the camera is saving in the TIFF (Tagged Image File Format) or RAW (raw data; a sort of digital negative file that doesn't contain any in-camera processing) format. Both are high-quality formats but give large file sizes, so you should use them only in special circumstances where you need the best quality.

As you reuse your media card, you notice less picture capacity. This occurs when you use Windows and a card reader to delete images from the media card after transferring them to your computer. Windows often leaves temporary files that take up space on the card. To rid the card of these files and free up space, reformat the card in your camera.

■ **Auto-Focus & Shutter Release Problems.** If you are new to digital cameras, prepare yourself for a delay between pressing the shutter release and the camera taking the picture. The delay varies with camera models but reflects the time it takes for your camera's auto-focus and automatic exposure features to adjust for the picture. The delay is a particular nuisance when taking action shots because it forces you to anticipate the action and press the shutter early.

You'll eventually get used to dealing with the auto-focus delay, but there are a few other problems with the auto-focus and shutter release you may run into.

The auto-focus doesn't seem to work. Make sure you activate your camera's auto-focus setting. Many cameras provide the option of switching from auto-focus to manual focus. Also, check your users manual for the proper way to activate the auto-focus mechanism. With most cameras, you press

the shutter release halfway down to activate auto-focus. Finally, check your batteries. When batteries are low, some cameras begin disabling the most power-hungry features, including the auto-focus mechanism.

The auto-focus will not lock onto your subject. If the subject is too far away or too close, some auto-focus cameras can't lock onto the portion of your image you want to focus on. If this happens, change the camera position or zoom in or out, and try again. If this doesn't work, switch the camera to manual focus.

Tree branches, fences, or window glass between your camera and your subject can fool your camera's auto-focus feature into focusing on the wrong thing. If this is the case, you may be better served to switch to manual focus. Or, if your camera supports it, use the "spot" focus. Spot focus displays a small focus point in the viewfinder that you focus directly on a particular object.

Finally, some cameras have difficulty focusing when it's too dark. In this situation, try manual focus, or if you have a laser light pointer handy (a good item to throw in your camera bag), try bouncing it off the subject and focusing on the beam.

Too long a delay between shots. Most digital cameras have a built-in delay between pictures. One way to decrease this delay is to turn off the fill-flash option so the flash doesn't have to recycle. You can also use the "burst" feature that's found on some cameras. When you press the shutter release in burst mode, the camera will take a rapid-fire series of five or more images with only a slight delay between the shots.

Nothing seems to happen when you press the shutter. Partially pressing the shutter release with an auto-focus digital camera normally activates the focusing mechanism. Many new users fail to press the shutter release completely down past the halfway point to take the picture. This should be the first thing you check if the shutter doesn't seem to work.

Next, make sure the camera is in capture mode, and not in transfer or playback mode (actual mode names may vary from camera to camera). Transfer and playback modes deactivate your camera's shutter release and won't let you take pictures. If the shutter release still doesn't work, check the battery level and make sure your media card is not full.

■ **LCD Problems.** Most digital cameras come with an LCD you can use to compose, view, and delete the digital pictures you take.

Sometimes your camera's auto-focus feature won't lock onto a subject when you are too close. When this happens, you'll have to move back from the subject or zoom out.

Most photographers find setting up and using card readers easier than connecting their cameras to their computers each time they want to transfer files.

The LCD is one great feature you can't find in the regular 35mm film world, but they are not completely without problems.

No image appears on your LCD. Make sure your LCD is on. Most cameras let you turn the display off and on as needed. Also check for low batteries, and if you are using the camera outside in bright sunlight, shade the LCD with your hand or some other object. Direct sunlight has a tendency to wash out the display and make it difficult to see.

Also, be aware that temperature extremes can slow the reaction time and darken the LCD display. In cold weather, keep the camera under your coat until you need to use it, and in hot weather, keep the camera in the shade. And you should never leave it in a hot car or direct sunlight.

Small white or black spots or discolored areas on your LCD. First, check for dirt or dust on the LCD panel and remove it with a soft brush or condensed air. If the spots appear to be part of the display, you may have "stuck" or "dead" pixels. It's not uncommon to see this with LCD screens, but if too many appear, you should consider taking the camera in for repair, especially if it's still under warranty.

■ **Image File Transfer Troubles.** Digital cameras come with cables and software that let you transfer your images from media cards to your computer. You can also invest in an inexpensive media card reader that lets you transfer picture files without attaching the camera. For most, the card reader is much simpler to use, but problems can crop up in either case.

The software is installed and cables connected, but the computer does not recognize the camera or the card reader. First, make sure the camera is on and set to transfer mode. If you are using a USB (Universal Serial Bus) connection and running Windows 95 on your PC, you'll need to upgrade to a newer version of Windows, as Win95 does not support USB.

If you do have a later version of Windows, and the connection still isn't working, your PC's USB ports may be disabled. Refer to your PC's users manual on how to enable the USB ports. Also try using a different port or disconnecting any other USB devices you might have connected. Conflicts between some computer devices and USB ports can prevent ports from working.

If all else fails, try uninstalling and then reinstalling the camera software. And don't forget to check your camera manufacturer's Web site for software updates.

The camera or card reader is recognized, but the images don't transfer. Make sure you have enough free space on your hard drive. If you don't, you may need to remove some unused programs or consider upgrading to a larger drive.

Parallax errors occur when what you see in the viewfinder is different than what the lens sees. This commonly happens with close-ups and results in pictures with the tops cut off.

If some of the files transfer, but the process stops at a particular image, the image file that caused the transfer to halt might be damaged. File damage occurs when camera batteries fail while taking a picture or when you remove the media card before your camera can fully save a picture. Individually transfer all the image files except the damaged one and then delete the damaged file directly on your camera.

Images transfer properly but won't open in your PC's photo-editing application. Most digital cameras save images in the JPEG (Joint Photographic Experts Group) format, a file format that most programs can open. However, some cameras have options that let you save images in TIFF or RAW format. Most image editors support TIFF, but because the RAW format is proprietary to the camera manufacturer, you can only open them using software provided with the camera. If you want to work on a RAW image using other software, use the camera software to convert the RAW image to JPEG or TIFF.

■ **Image Quality Issues.** The automatic features of your digital camera help you take great pictures with a minimum of fuss and intervention. Sometimes, though, the images you take will look less than perfect on your computer monitor or in print. Here are some reasons why this happens and what you can do.

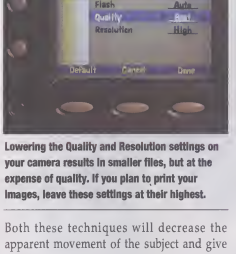
The tops of your pictures are cut off. This is a common occurrence in point-and-shoot cameras where the viewfinder and camera lens are separate. As you compose your shots, especially close-ups, what you see in the viewfinder is not really what the camera sees through the lens, causing discrepancies known as **parallax errors**. To avoid this, use your LCD to compose your shots instead of the viewfinder, as the LCD displays what the lens actually sees.

Strange colors. The color of the light illuminating your subject, called the "color temperature," differs between sunlight, fluorescent light, and incandescent light. Digital cameras have auto-white balance controls that automatically adjust the image exposure for color temperature differences, but certain lighting conditions can fool the auto-white balance controls, resulting in images with an odd color-cast.

Check your camera's manual white-balance setting. This setting lets you choose the type of lighting from a menu and is usually more accurate than automatic controls.

Blurry, out-of-focus pictures. If you're getting blurry shots that seem out of focus, make sure the auto-focus is on and that you are correctly activating it. Also, check your camera lens and make sure it's free of dust and fingerprints.

How steady you hold the camera also affects the sharpness of an image, especially in low-light situations. When possible, use a tripod or monopod or steady the camera by holding your arms next to your body and leaning against a stationary object. If you are taking action shots, pan the camera with the action or try zooming out to a wider angle.



Lowering the Quality and Resolution settings on your camera results in smaller files, but at the expense of quality. If you plan to print your images, leave these settings at their highest.

Both these techniques will decrease the apparent movement of the subject and give you less blur.

Poor picture quality and pixelization. First, check your camera's resolution and quality settings. Remember that you can adjust these to get more pictures on your media card, but you do so at the expense of lower-quality pictures.

It's also a good idea to avoid depending on your camera's digital zoom, which simply magnifies part of the image sensor array inside of your camera and usually provides poor results. Instead, stick with the optical zoom, which uses the camera lens to enlarge the picture.

Pictures are too light or too dark. Check your camera to make sure the auto-exposure option is turned on and the exposure compensation feature is turned off. Exposure compensation lets you over- or underexpose pictures in certain situations and is handy when your subject is in front of a bright background, such as a sunny window. But if you accidentally leave it on in other conditions, the feature will give you the incorrect exposure.

When your pictures come out too dark in low-light situations, make sure your flash is on and the subject is within the flash range. Most flash units have a range of 10 feet to 12 feet. Beyond this range, your subject will not get enough light from the flash.

Shadows at the bottom of an image. If your camera has a removable lens hood, take it off when using the flash. The hood can sometimes block light coming from the flash and create shadows. Large shadows can also appear when using an external flash strobe that is not correctly synchronized with your camera, but most digital cameras that support external flash units require you to purchase units created specifically for your camera.

Images look fine on-screen but not when you print them. Always choose the highest resolution and highest quality settings on your camera when you intend to print your images. The camera resolution determines the number of pixels your camera captures for each image, and the more pixels you capture, the larger you can make your prints. A good rule of thumb is that you need 200 to 300 pixels per inch for the best prints. This varies with each printer, but it's a good guide. You can determine your camera's maximum print size by dividing its resolution by 200. For example, dividing a resolution of 1,536 x 1,024 pixels by 200 gives you a maximum print size of 7.68 x 5.12 inches.

Also, check your printer's quality setting. If you click Properties in the Print dialog box, you should see options that let you change between Draft, Normal, and Best settings. You should choose the Best quality setting when you print images. The print Properties dialog box also lets you select the paper type. Use photo-quality paper to get the best results.

Finally, if you see white streaks or discoloration in the printed image, your printer may be running out of ink or the print heads may need cleaning or alignment. Check your printer's manual on how to perform these tasks.

■ **Take, Look & Learn.** You can solve most digital camera problems with a basic understanding of camera features and of how the camera works, both of which you'll find in your users manual. To really become comfortable dealing with problems, however, you need to experiment with camera settings, practice taking pictures, and examine and critique the images you get. The great thing about digital photography, though, is that other than a little bit of your time, the practice won't cost you a thing. LS

by John Lortz and Susan Lewitt

From The Silver Screen To Your PC

How To Install A DVD Drive

If you purchased your PC a couple of years ago, there's a good chance it didn't include a DVD-ROM drive, although the drives are practically standard equipment on PCs sold today. You can easily add a DVD-ROM drive to your PC, and it's a pretty inexpensive upgrade. The main advantage of upgrading to a DVD-ROM drive is that you'll be able to watch DVD movies on your PC. There are also a handful of useful programs that are available on DVD-ROM, such as Microsoft's Encarta Reference Library 2003 ($74.95; http://www.microsoft.com) and Broderbund's Print Shop Deluxe 15 ($49.99; http://www.broderbund.com). If you buy the CD-ROM versions of these programs, you'll find that you often have to switch discs while you're using the program, which gets old quickly. You won't have that problem using a DVD-ROM, however, because DVD-ROMs can store much more information than CD-ROMs.

DVD-ROM drives are very similar to CD-ROM drives. They both read audio CDs, video CDs, and CD-ROMs. Neither type of drive can record to CD or DVD media, but both types of drives can read CD-Rs (CD-recordables) and CD-RWs (CD-rewriteables). Both CD-ROM and DVD-ROM drives have recordable counterparts: CD-RW drives and DVD-RW or DVD+RW drives (more on these in a moment). CD-ROM drives can't read any type of DVD media, however. This is because the data on DVDs is packed together very tightly, and the laser in a CD-ROM drive is too "fat" to pick up the smaller bits of data that are stamped on a DVD movie or DVD-ROM.

If you're a video-editing enthusiast, you may be interested in a recordable DVD drive, such as a DVD-RW or DVD+RW drive. These two types of recordable drives use slightly different standards, but they both accomplish the same thing. You can use either type of drive to record video files to a DVD that you can play on a standard DVD player or DVD-ROM drive, so you can turn your home movies into a DVD video library. Both types of drives read all CD formats and DVD movies, DVD-ROMs, and DVD-Rs. Both can also record to CD-R and CD-RW media. However, DVD-RW drives cannot record data to DVD+RW media, and DVD+RW drives cannot record data to DVD-RW media. The process for installing a DVD-ROM, DVD-RW, or DVD+RW drive is the same, although a DVD-RW or DVD+RW drive will likely include extra software for recording files to DVD.

Most DVD-ROM drives read DVDs at a speed of 16X. That doesn't sound very fast when compared to CD-ROM drives that have a speed of 40X or better, but a 16X DVD-ROM drive is actually faster than a 40X CD-ROM drive because the industry uses a different basis for measuring DVD-ROM speeds than it does for CD-ROM speeds. For a CD-ROM drive, a speed of 1X equals a data transfer rate of 150KBps (kilobytes per second), but for DVD-ROM drives, a speed of 1X equals a data transfer rate of 1,350KBps. So, a 40X CD-ROM drive has a maximum data transfer rate of 6,000KBps, but a 16X DVD-ROM drive has a maximum data transfer rate of 21,600KBps. However, DVD-ROM drives generally read CDs at the CD-ROM 40X speed. As mentioned a moment ago, the data on a DVD-ROM is packed together more tightly than it is on a CD-ROM, so a DVD-ROM drive can read more data in less space (and thus, reads it more quickly) from a DVD-ROM than it can from a CD-ROM.

■ **Time To Shop.** Several companies make and sell DVD-ROM drives, including Toshiba, Sony, and Pioneer. The drives aren't very expensive. You can pick one up for as little as $50, although prices are generally between $70 and $100. There isn't that much difference between one DVD-ROM drive and another, although DVD-ROM drive kits sometimes include extra software that may appeal to you. You'll definitely want to make sure that the DVD-ROM drive you buy includes a software decoder (almost all do), which is the software your PC uses to play the video and audio files from a DVD movie.

Generally speaking, it's best to stick with the well-known brands when shopping for a DVD-ROM drive, but if you're a bargain hunter, you can give one of the cheaper, less-known brands a try without risking too much.

It's pretty easy to install a DVD drive. You pop out the old CD-ROM drive, slide the DVD drive in its place, connect a couple of cables, tighten a few screws, and install some software. You don't even have to remove the CD-ROM drive if you don't want to.

DVD-RW and DVD+RW drives are much more expensive than DVD-ROM drives because of their added functionality. However, the prices for recordable DVD drives are dropping quickly. The drives used to cost $700 or more in 2001, but in the latter half of 2002, the prices have dropped to about $300 to $400, making rewriteable DVD drives more practical for many home users. DVD-RW and DVD+RW usually record at 1X or 2X, but expect speeds to increase in the coming months. Pioneer is the primary manufacturer of DVD-RW drives, and HP and Sony are the primary manufacturers of DVD+RW drives, although other brands are available for both types of drives.

Know which connector is which before you install your DVD drive.

■ **Cables, Cords & Screws.** It's pretty easy to install a DVD drive. You pop out the old CD-ROM drive, slide the DVD drive in its place, connect a couple of cables, tighten a few screws, and install some software. You don't even have to remove the CD-ROM drive if you don't want to. You can install the DVD drive in a separate 5.25-inch drive bay. As for tools, you should only need a Phillips screwdriver. If you're not replacing another drive in your PC, you'll also need an audio cable to connect the DVD drive to your PC's sound card and an IDE (Integrated Drive Electronics) cable to connect it to your computer's motherboard. Your drive should include mounting screws so you can attach the drive to the PC's drive bay, but if it doesn't, you'll need to buy them, as well. All of these items may be included in the DVD drive you purchase, but you can also buy them separately for a few dollars. If you *are* replacing a CD-ROM drive with a DVD drive, you can simply connect the DVD drive to your PC using the audio and IDE cables that were connected to the CD-ROM drive, and reuse the CD-ROM drive's mounting screws.

Before we crack open your PC, take a look at the illustration showing the connections on the back of a DVD drive so you can familiarize yourself with them before you install one. The first two connections are the digital audio cable connection and a connection for an analog audio cable. You'll use this cable to connect the drive to your PC's sound card. Next, you'll see three sets of posts with a plastic block covering one set of posts. This is the jumper setting for the DVD drive. You'll have to set this a certain way, which we'll discuss in just a moment. The IDE cable connection is immediately to the right of the jumper. Finally, you'll see a four-pronged connection, which is where you'll connect the DVD drive to your PC's power supply.

The first thing you should do is check the jumper settings on the back of your DVD drive. If you're going to use the DVD drive as the PC's primary optical drive (which is almost always the case), make sure the plastic block covers the jumper pins labeled "Master." If the jumpers on your drive aren't labeled, the drive's documentation should illustrate the available jumper settings. If you have a second optical drive installed in your system, such as a CD-RW drive, you'll want to set the second drive's jumper "Slave," which in all likelihood it already is.

OK, now you're ready to get your hands dirty. First, unplug all devices from your PC, especially the power supply cable. Open your computer's case and ground yourself by touching a bare metal section of the case. If you're replacing a CD-ROM drive with a DVD drive, take a close look at the back of the CD-ROM drive that's installed in your system. Note the cables that are attached to the back of the CD-ROM drive. You'll connect the same cables to the DVD drive in a few moments. Unplug all of the cables from the CD-ROM drive, starting with the power cable (the cable plugged into the connector at the far right end of the drive). The IDE cable will be next, followed by the audio cable. Unscrew the screws holding the CD-ROM drive into place and push the drive out of the drive bay.

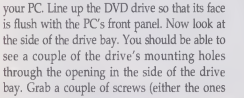
Now that the CD-ROM drive is out of the way, you're ready to install your DVD drive. Slide the DVD drive into the empty drive bay. First, plug the audio cable into either the analog or digital audio connection on the back of the DVD drive, depending upon which type of cable you're using. The connector for the digital audio jack is much smaller than the one for analog audio, so it should be easy to tell which connection you'll use. If you're replacing a CD-ROM drive, the other end of the audio cable should already be attached to the sound card. If the cable is not attached to the sound card, look for a small connector on the sound card labeled CD IN. Plug the other end of the audio cable to this connector.

Next, plug the IDE cable into the IDE port on the back of the drive. The ribbon cable you use to connect the drive to the PC's motherboard probably has a red stripe along one side. The red stripe should be lined up with the right side of the IDE port on the back of the drive when you plug it in. There is also a

small, square opening in the upper-middle portion of the drive's IDE port. The IDE cable should have a corresponding notch sticking out in the middle part of the top of the connector. Line up the notch with the slot in the IDE port and plug in the IDE cable.

Now it's time to connect the DVD drive to the computer's power supply. The power supply is a box attached to the back panel of your PC that has a gaggle of wires pouring out of it. Each set of four wires ends in a white plastic connector, some of which are larger than others. You'll use one of the larger connectors to connect the DVD drive to the PC's power supply. Notice that two corners of the plastic connector are beveled. These bevels indicated the top of the connector, so line it up accordingly when you plug it into the DVD drive's power supply connection.

Once you've connected all the necessary cables to the drive, it's time to affix the drive to your PC. Line up the DVD drive so that its face is flush with the PC's front panel. Now look at the side of the drive bay. You should be able to see a couple of the drive's mounting holes through the opening in the side of the drive bay. Grab a couple of screws (either the ones



You'll need a software decoder, such as Sonic Solutions' CinePlayer, to watch DVD movies on your PC.

that came with your drive, the ones that you're borrowing from the CD-ROM drive, or the ones that you had to buy because the first two options aren't available) and put them in the drive's mounting holes. Check the alignment of the drive again and then tighten the screws until the drive is secure. Remove the panel from the other side of your system's case and repeat.

Plug in the PC's power supply cable and restart your machine. Your PC should detect the presence of the new drive and install the drivers for it, or barring that, your system should install basic drivers for an optical drive so that it'll be functional. If this is the case, you can use the disc that came with the drive to install the drivers. So, we're done installing the hardware, but to really utilize your DVD drive, you'll need to install some additional software.

Once you install a DVD-RW/+RW drive, you can create a DVD movie with your PC using video-editing and DVD recording software.

■ **Home PC Theater.** Your DVD drive needs two important types of software to work properly. The first is the drive's driver software, which we've already installed. The second is the drive's aforementioned software decoder. (Installing a rewriteable DVD drive will likely also include installing some sort of DVD authoring software.) Once upon a time, DVD-ROM drives used hardware decoders rather than software decoders because software decoders put too much of a strain on CPU resources, which resulted in some quality issues when trying to play a DVD movie. Software decoders have improved since then, and most PCs made within the past two to three years are powerful enough to use a software decoder without hurting playback quality when watching a DVD.

The most popular software decoders are PowerDVD from CyberLink (http://www.gocyberlink.com/english/index.jsp), WinDVD from InterVideo (http://www.intervideo.com/jsp/Home.jsp), and CinePlayer from Sonic Solutions (http://www.sonic.com). Chances are, your drive includes a version of one of these decoders.

DVDs use the MPEG-2 (Moving Picture Experts Group-2) video and audio encoding standard and also the Dolby Digital audio standard (also called AC-3). Almost all software decoders can decode both MPEG-2 and Dolby Digital data. To enjoy true Dolby Digital sound when watching a DVD on your PC, you'll also need a sound card that supports Dolby Digital and a 5.1 speaker system (five surround-sound speakers and a subwoofer). Of course, these aren't *required* to watch (and listen to) a DVD on your PC, but they certainly improve the quality of the audio. Be sure to install the decoder software that came with your DVD drive as soon as you've installed the drivers. You should also check the DVD drive manufacturer's Web site for driver and software decoder updates as soon as you install these items.

■ **Worth The Effort.** A good DVD-ROM drive puts the "Mmmmm" in a multimedia PC. The drives are so cheap now that it's hard to imagine not buying one for your system, especially if you like larger programs, such as encyclopedias and games, that are available on DVD-ROM. The ability to watch your favorite DVD movie on your PC while your television is otherwise occupied is nice, too. LS

by Michael Sweet

Once upon a time, ***DVD-ROM drives used hardware decoders rather than software decoders because software decoders put too much of a strain on CPU resources, which resulted in some quality issues when trying to play a DVD movie.***

Network Nuisances

What To Do When Things Go Wrong

Today's computer users live in the age of the Internet, of home networks, of email and instant messaging. As computers have become more affordable, home networks have sprung up like mushrooms after a summer thunderstorm. Sharing printers, files, and connections to the Internet have propelled home networking from a geek fantasy to an everyday requirement. Yet the networks we've come to rely upon can and do fail us when hardware and software components decide to stop cooperating. If you find yourself pulling your hair out while troubleshooting your network, this article should help you retain a full head of hair.

Easy Come, Easy Go. The problem many computer users face with troubleshooting home networks is due in part to the ease with which a home network can be set up. Especially with Windows XP, setting up a home network for the first time doesn't require you to understand the underlying principles and technology that let your computers communicate with each other. Then when trouble strikes, the average user may not know where to begin. To help you keep your network running smoothly, we'll discuss how most home networks function, look at where the potential trouble spots are, and point you toward some additional resources.

Network Foundations: A Three-Layer Cake. The goal for any computer network is for two or more computers to be able to exchange information, or **data**. Whether you are accessing a shared printer, listening to music stored on a second computer, or visiting your favorite Web site, a network is primarily a number of computers interchanging data. The trick is in enabling all the elements or **node**s of a network to successfully talk to each other. Although networking technology is a rapidly evolving field, there are some core components that transcend the methods. For home computing, there are three main layers we'll focus on: an application layer, a transport layer, and a physical layer.

To help illustrate how networks use these layers to perform this exchange of information, we'll examine what happens when you try to access a file you have stored on a second computer on your network. From a user's perspective, in Windows 98/Me, you simply click the My Neighborhood icon, select the remote computer, the shared drive, and then the file itself. If you are using WinXP, first click Start, My Computer, and My Network Places. Although this may seem transparent to you, there is more happening underneath.

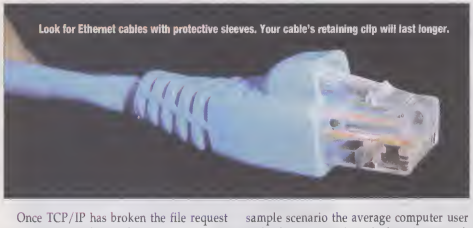
Application layer. The first step your computer performs is to create a request for a file. This request includes the name of the file, the name of the shared drive it is stored on, and the name of the computer where the shared drive is located. Once this request is created, the transport layer, TCP/IP (Transmission Control Protocol/Internet Protocol), processes it.

Transport layer: TCP/IP. Who would have thought a group of protocols with such an unwieldy name would have such a dramatic influence on modern day computing? TCP/IP is the glue that welds the millions of computers that constitute the Internet into a useful network. Like the Internet, your home network probably uses TCP/IP. Once Windows has generated the file request, it hands it off to the TCP/IP program, which is sometimes referred to as the **stack**.

When the TCP/IP stack receives the request, it processes it for several important pieces of information. The first is the IP (Internet Protocol) address of the remote computer. Each computer on a TCP/IP network requires a unique IP address. Think of it as a phone number. If more than one computer on a network has the same IP address, they'll have what is termed an addressing conflict that will prevent them from communicating successfully on the network. The second piece of information is the IP address of the computer requesting the file. This "return address" tells the remote computer where to send the requested file. Another obvious piece of information is the name of the file itself. Finally, TCP/IP needs to know which program to send the request to.

Armed with this information, the TCP/IP stack creates a series of data packets that are sent to the remote computer. Each packet contains the previously mentioned information, as well as a small part of the initial file request. TCP/IP breaks this request into packets, assigns them each a number, and passes them on to the physical layer.

Physical layer: Ethernet. Although today's home networks utilize a wide array of networking technologies to interconnect computers, most utilize the trusty Ethernet topology for handling the physical layer of networking. Ethernet is a mature, well-understood technology that is capable of handling high-speed connections. The Ethernet specification determines the physical elements of your network, from the NIC (network interface card) to the wires, hubs, and switches.



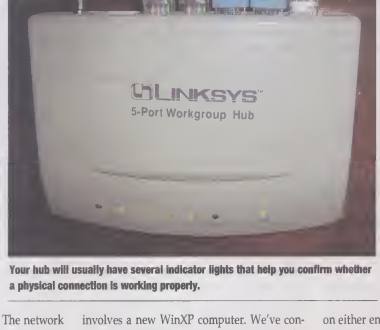
Look for Ethernet cables with protective sleeves. Your cable's retaining clip will last longer.

Once TCP/IP has broken the file request into packets, it forwards them on to your computer's NIC. The NIC's software breaks these packets into smaller chunks called frames and converts them into electrical impulses that are sent out across your network cable. In the case of wireless networks, these frames are sent out as radio waves.

Apply The Layers. Knowing how networking functions on a theoretical level isn't very valuable if it doesn't help with making things work on a practical level. We'll translate the geek language of networking to the tools you need to get your network back in action. We'll also focus on the most likely culprits affecting your network. To simplify things, we'll refer to a model network we've set up to assist in demonstrating sound troubleshooting tactics.

Our model network consists of a notebook computer running WinXP Professional and a desktop PC running WinXP Pro. The network has a Hewlett-Packard LaserJet printer connected to the WinXP PC, and the computers are physically connected with Ethernet cables to a small hub. In turn, the hub is connected to our DSL (Digital Subscriber Line) router for fast Internet connectivity. As we delve deeper into troubleshooting, we'll discuss the various settings and specifics of our setup. In our approach, we won't take any shortcuts, nor skip over the tougher tasks. You may not always need to follow our procedures, but they may serve you well in the future.

Troubleshooting is a skill that is best learned through experience. To help you gain the necessary experience, we'll go through a sample scenario the average computer user with a home network might face. As we work toward a solution for our scenario, follow our steps with your own network. A little homework now may pay handsome dividends in the future. Our troubleshooting scenario involves a new WinXP computer. We've connected the Ethernet cable to its NIC and the hub, but we can't connect to the Internet or the other computer.



Your hub will usually have several indicator lights that help you confirm whether a physical connection is working properly.

This scenario is a common one, where a user adds a new computer to an existing network. Once a network is installed, it has a tendency to grow over time. Computers that aren't connected to the network miss out on sharing files, peripherals, and Internet connections. Having your own home network means that you've just been promoted to Network Administrator. Time to earn that title.

Step 1: Diagnosis. Our first step is to accurately diagnose the problem. It's important to resist the urge to make a series of random changes to settings or rip out the physical components of your network. The time spent accurately diagnosing the problem will pay off in the long run. Diagnosing network problems involves investigating two main areas: hardware and software. In this scenario, our problem could be related to either area, but we'll start our search for clues in the hardware arena. We'll move on to software after we've ruled out hardware as the culprit. A good hint that the problem may be hardware-related is if things suddenly stop working and you are sure you've made no changes to software. In this scenario, a computer that functions normally as a standalone computer can't operate on the network.

Step 2: Rule out hardware failures. Our WinXP computer has three hardware components that are responsible for connecting us to the network. Our computer has a NIC, a hub, and an Ethernet cable connecting the two.

Ethernet cables are one of the first items to examine when troubleshooting network problems. First check to see if the cable is the correct type. Ethernet cables come in two types: straight-through and crossover. If you are connecting two computers directly together without a hub or switch, you will need a crossover cable. Most home networks utilize hubs or switches and thus need straight-through cables. Most crossover cables are clearly labeled and often have yellow casings.

Next make sure the cable is properly connected at each end. Ethernet cables have connectors that are similar to those on either end of a phone cord. A small retaining clip on the connector keeps it firmly plugged into the NIC, but these clips can wear out over time.

Finally, look for damage to the cable. If there are any cuts or obvious damage to the cable, the wires inside may not transmit the Ethernet signal properly. Although Ethernet cables have a sturdy shielding protecting the wires, they can be damaged.

After examining the Ethernet cable, the next item to inspect is the NIC. In our system, our NIC is an Intel Pro/100+ Ethernet adapter. Before we purchased it, we checked Intel's Web site (http://www.intel.com) to see if the adapter was supported under WinXP. The NIC

Antistatic wristbands are available at most computer stores for about $5, and they safely channel static electricity away from your computer's components.

is a PCI (Peripheral Component Interconnect) card with one port for our Ethernet cable and two diagnostic lights.

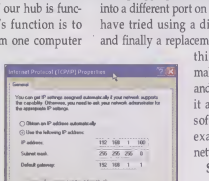
Although we've only recently tried to connect the computer to the network, we installed the card more than two weeks ago. To see if the card is physically installed properly, power down the computer and open up the case. Whenever you work inside a computer, it's important to follow a few safety steps. First, unplug the computer from the wall or power strip. Second, use an antistatic wristband to prevent static electricity from damaging your computer's components. Antistatic wristbands are available at most computer stores for about $5, and they safely channel static electricity away from your computer's components. If you don't have an antistatic wristband handy, you can use an antistatic mat that performs the same function.

Next, make sure the NIC is seated properly in the PCI slot. Each PCI card has a series of electrical contacts that connect it to your computer's motherboard (sometimes referred to as a system board). If the NIC isn't making good contact, the card may not function properly. Sometimes a card may have some type of corrosion on the contacts that affects its performance. Although it may be possible to remove the corrosion from the contacts, you'll be better off replacing the NIC.

Finally, take advantage of the diagnostic LEDs (light-emitting diodes) on the NIC. The first is a green link/activity light that indicates whether the Ethernet card is communicating with the hub. The second light indicates whether the NIC is operating at 100Mbps (megabits per second).

Once we eliminate the NIC as the source of our trouble, it's time to see if our hub is functioning properly. The hub's function is to receive Ethernet frames from one computer and forward them on to the destination computer. Hubs usually have three types of plugs or jacks: a jack for the power supply, an Ethernet jack for connecting the hub to a cable modem or router, and the jacks used for the network.

The first step is to make sure your hub has power, indicated by an illuminated LED. If the LED is lit, you are in business. Otherwise, make sure the power cord is properly plugged into the hub and the wall outlet.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

It's a good idea to write down your IP (Internet Protocol) settings when troubleshooting a network issue.

Next, check to see if the computers on your network are properly connected to the hub's LAN (local-area network) ports. Each port on the hub has an LED that lights up when a computer's Ethernet cable is connected to it (assuming the computer at the other end is turned on).

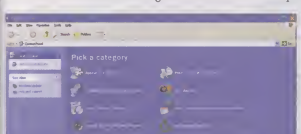
Finally, make sure the hub is properly connected to your cable modem or DSL router with a crossover cable. Most cable modems or routers include a crossover cable, but remember that a straight-through cable will not function properly. Once your crossover cable is connected to your modem or router, a matching LED on the hub should be illuminated.

After examining our network hardware, our problem doesn't appear to be hardware-related. Our Ethernet cable is in good shape, the NIC is properly installed, and the hub is properly configured. When we plug the Ethernet cable into the NIC and the LAN port on the hub, the activity lights on both ends are illuminated, telling us the physical infrastructure is working properly. If this hadn't been the case, we would first have tried plugging our computer's Ethernet cable into a different port on the hub. Next we would have tried using a different Ethernet cable and finally a replacement NIC. The important thing to remember is to make one change at a time and test the result. Because it appears the problem is software-related, we will examine our computer's network settings next.

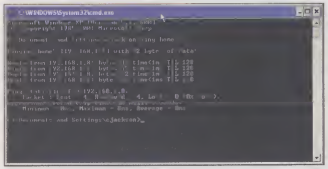
Step 3: Check network configurations. Because we've ruled out hardware as a possible cause of our problems, it's time to turn our attention to software-related problems. Software problems usually consist of improper configuration of the appropriate network settings. The most important of these are the computer's name, workgroup, and IP configuration.

Our first task is to make sure the computer has a unique name and its workgroup name matches the other computers on the network. For Windows 98 or Windows Me, right-click the Network Neighborhood icon and select Properties. Next choose the Identification tab. In the Computer Name field, check to see that the name is unique on the network. If it isn't, you'll need to change it. If you're using WinXP, click Start, right-click My Computer, and click Properties. Both the full computer name and workgroup name should appear on the Computer Name tab.

Next, we need to make sure the computer is using the proper IP address, subnet mask, and default gateway. We'll also want to make sure the DNS (Domain Name System) settings are correct. If you have a DSL router or cable modem for your Internet connection, you will likely be using DHCP (Dynamic Host Configuration Protocol) to get the proper configuration. The first time your computer is started on a DHCP network, it sends out a request for its IP configuration to the router.

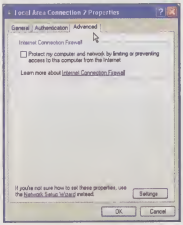


Windows XP has transformed the Control Panel into a series of wizards to assist you in configuring your computer. If you're more comfortable with the old look of the Control Panel, click Switch To Classic View on the left of the screen.



The venerable DOS prompt gives you access to one of a network administrator's favorite tools, the ping utility.

If you are manually assigning IP configuration settings, you will need to make sure you have the correct settings on each of your computers. Each computer on a TCP/IP network needs to have a unique IP address, a common subnet mask, and a common default gateway. Think of the IP address as your computer's phone number, the subnet mask as the area code, and the default gateway as the operator. The default gateway should be the IP address of your cable/DSL router.


Local Area Connection 2 Properties
General
Authentication
Advanced
Internet Connection Firewall
Protect my computer and network by limiting or preventing access to this computer from the Internet
Learn more about Internet Connection Firewall
If you're not sure how to set these properties, use the Network Setup Wizard instead.
Settings...
OK
Cancel

Firewalls are important for protecting your network, but make sure you properly configure them.

Check your IP settings in Win98/Me by right-clicking Network Neighborhood and selecting Properties. Next, highlight TCP/IP Ethernet Adapter and select the Properties button. The next window has seven configuration tabs, but we're only concerned with three: Gateway, IP Address, and DNS Configuration. Select IP Address and make sure that if you're using DHCP, you have selected Obtain An IP address Automatically. If you're not using DHCP, enter the proper IP address and Subnet Mask. Next, select the Gateway tab and check that the proper Gateway is entered. Finally, select DNS Configuration and enable DNS. You'll need to check with your ISP for the proper DNS settings.

For WinXP users, click Start, Control Panel, and then select Network And Internet Connections. Next click Network Connections, right-click Local Area Connection and choose Properties. In the Networking tab, Highlight Internet Protocol (TCP/IP) and click the Properties button. The Internet Protocol (TCP/IP) Properties dialog box in WinXP has only one tab marked General, where you can configure your IP address, gateway, and DNS servers.

After verifying all our settings, we were still unable to see the other computer on our network. To make sure we have completely eliminated any configuration issues, we dig into our software toolbox and pull out an old favorite: the ping utility. You can access ping from the DOS prompt, or command line. To launch the command line, select Start and click Run. Type **command** (for Win98/Me) or **cmd** (for WinXP) in the Open field and click OK. This will start the MS-DOS prompt. Next type **ping www.google.com**. You should see an output in the window similar to this:

```
PING www.google.com (216.239.35.101): 56
  data bytes
64 bytes from 216.239.35.101: icmp_seq=0
  ttl=38 time=104.405 ms
64 bytes from 216.239.35.101: icmp_seq=1
  ttl=38 time=98.699 ms
64 bytes from 216.239.35.101: icmp_seq=2
  ttl=38 time=101.483 ms
64 bytes from 216.239.35.101: icmp_seq=3
  ttl=38 time=107.226 ms
64 bytes from 216.239.35.101: icmp_seq=4
  ttl=38 time=106.328 ms
```

This tells us two valuable things: We can reach the Internet, and our DNS settings are working. Next we want to ping a computer on our network. We try pinging home2, the computer name of our second computer.

```
PING Home2
Ping request could not find host Home2.
Please Check the name and try again.
```

Now most of the remaining clues are pointing to an application problem.

■ **A Firewall Proves The Culprit.** Our next stop is to make sure we don't have any firewall software that may prevent our computers from communicating. If you're running any of the commercially available firewall packages, you'll want to check your manual for configuration information. In our case, we want to make sure we do not have WinXP's ICF (Internet Connection Firewall) blocking access. To check, click Start, Control Panel, and Network And Internet Connections. Click Network Connections, right-click the Local Area Connection, and select Properties. Select the Advanced tab and make sure the checkbox to enable ICF is clear. In our case, we had initially been using ICF to protect our computer, but this was preventing the two computers from communicating. Once we disabled ICF, we could browse to the other computer from My Network Places. Our DSL router has built-in firewall software to protect us, so ICF is unnecessary.

■ **Your Own Network Administrator.** Unfortunately for many home users, troubleshooting a network problem isn't as easy or clear-cut as our scenario. If you run into a stubborn networking issue, don't forget the strategies we've covered. Another tool that many network administrators value highly is Google's Web site (http://www.google.com) where they can search for solutions computer users, like yourself, post. If you find yourself getting an ulcer from a network problem, follow the steps we've illustrated and you'll find that the solution is at your fingertips. LS

by Chris Jackson

If you're running any of the commercially available firewall packages, you'll want to check your manual for configuration information.

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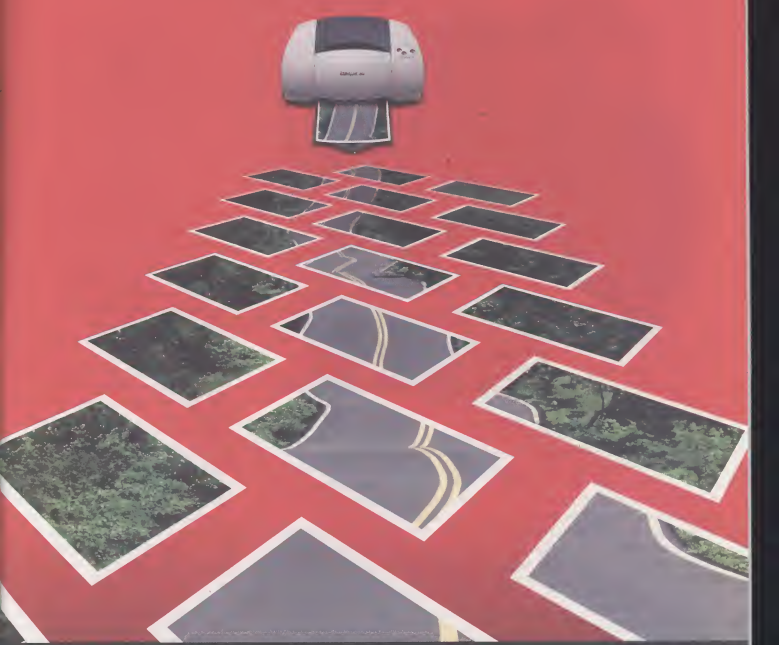

At twice the resolution of the nearest competitor, the Z65 photo printer doesn't just break the rules, it changes the game altogether. The Z65 offers 4800 dpi* (5.8 megapixels) of resolution, dual paper trays, plus Lexmark's legendary speed – all this for less than $200. Available from Best Buy, Circuit City, CompUSA, Dell, Office Depot and Staples. Visit us at www.lexmark.com/road10/ for more information about Lexmark products.

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Make A Connection

What To Do When You Can't Access The Internet

Arthur C. Clarke once wrote, "Any sufficiently advanced technology is indistinguishable from magic." Part of the reason for the ambiguity between magic and technology is the complexity often inherent in technology. For many of us, the Internet is one of those mystically complex technologies. When we can't get online, many of us turn to the shamans at tech support, hoping they can utter some magical incantation to make everything OK again.

The problem is that any complex system is, in most cases, difficult to troubleshoot. Problems with your PC, your local telephone network, or your ISP (Internet service provider) can cause connection problems. In this article, we'll examine some of the more common problems and offer solutions.

■ **Wires & Cables.** Whenever you start troubleshooting anything, it's always best to start with the simple problems and work your way to the more difficult problems. With that in mind, we'll review some information you may already know. Besides, it's better to take a few minutes to remind yourself of the obvious than to embarrass yourself when calling tech support.

If you have an external modem, make sure the modem properly connects to the PC. External modems typically use a null-modem cable to connect to a 9-pin serial port on the back of the PC, but some modems use USB (Universal Serial Bus) instead. Regardless of the cable your modem uses, make sure it securely connects to both the PC and the modem. Also, make sure you have the power source plugged into a working outlet and correctly plugged into the modem.

Whether you have an internal or external modem, make sure the telephone line is securely in place. Modems include two jacks, one labeled Line and another labeled Phone. Make sure the wire running to the wall jack is plugged into the Line jack on the back of the modem. You can connect an optional telephone to the Phone jack.

■ **We Have A Problem.** Although arcane, error messages can contain important information. We listed a few of the more common topics of error messages below, along with their solutions.

Modem isn't installed. If you're creating a new dial-up connection in Windows 98 or Windows Me, your modem may not appear in the list of available modems or you may see an error message stating "Error 633: The modem is not installed or configured for Dial-Up Networking. To check your modem configuration, double-click the Modems icon in Control Panel." This error may occur even if the modem is properly connected.

In some instances, a corrupt Windows Registry or a file known as Telephon.ini can cause this problem in Win98 and WinMe. To fix a Registry error, open the Start menu and click Run. Type **regedit** and press ENTER to open the Registry Editor.

Before editing your Registry, however, make sure you have a backup on hand. One wrong move while changing Registry settings can generate dire consequences. For more information about the Registry, see "Check & Clean Your Registry" on page 41.

To continue, select Find from the Edit menu and search for a ProviderFileName0 entry. Right-click the ProviderFileName0 entry and select Modify. The proper value should be TSP3216L.TSP. Click OK, close the Registry Editor, and restart Windows. This should resolve the problem.

But if the problem persists even if you entered the proper value in the Registry, the Telephon.ini file may be corrupt. Open the Start menu, click Run, type **tapiini.exe** in the field, and click OK to restore the Telephon.ini file. Restart your computer.

I'm busy; go away. Another popular error message simply states, "Modem is already in use." But if your modem is *not* in use, you have a problem. Certain software can interfere with the COM ports your modem uses. Old versions of the Palm's synchronization software, for instance, can cause problems. Open the Control Panel, click Add/Remove Programs (Add Or Remove Programs in WinXP), select the program causing the problems, and click Remove.

Similar error messages include "Error 630: The computer is not receiving a response from

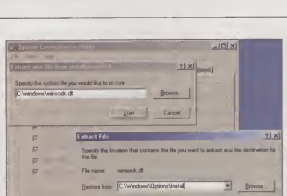
Line noise *is essentially background noise on the phone line that makes it difficult for modems to hear each other.*

the modem," "Communication port is invalid or busy," or "Error 630: The modem is not responding correctly." If you receive any of these error messages, make sure your connections are secure, and if you're using an external modem, turn the modem off and back on.

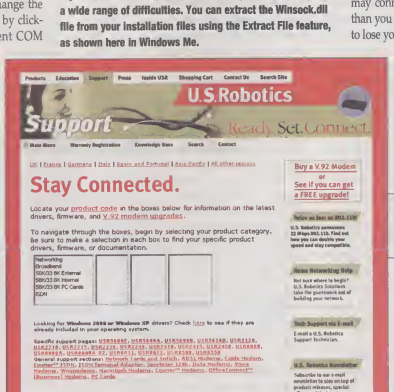
In Win98 and WinMe, these error messages can also occur if you're using the Support SerialKey Devices option. To fix the problem, double-click Accessibility Options from the Control Panel, choose the General tab, and deselect the Support SerialKey Devices checkbox. Or, you can leave this option enabled and change the COM port your modem is using by clicking Settings, selecting a different COM port, and clicking OK.

Modem? What modem? Another Windows favorite is the disappearing modem trick. If you receive the "Could not detect modem. It may be in use, turned off, or not installed properly," error message in Win98 or WinMe, you have a bad Winsock.dll file.

If you're running WinMe, open the Start menu, click Run, type **msconfig** to open the System Configuration Utility, and press ENTER. On the Startup tab, deselect the *StateMgr checkbox and click OK. Restart the system when prompted and open the System Configuration Utility again. Choose the General tab, click the Extract File button, and type **c:\windows\winsock.dll** in the Specify The System File You Would Like To Restore field. Next, click the Start button in the Extract One File From Installation Disk window, select Browse in the Extract File window, and locate your Windows installation files. These files may be on your hard drive in at C:\WINDOWS\OPTIONS\INSTALL or you can use your installation CD-ROM if you have one. Click OK and follow the instructions.



If your Winsock.dll file became corrupt, you may experience a wide range of difficulties. You can extract the Winsock.dll file from your installation files using the Extract File feature, as shown here in Windows Me.



Solving these connection problems can be a little more difficult. EarthLink spokesman Bob McNamara recommends that users update their modem drivers if they're experiencing any strange connectivity issues. "Go to the modem manufacturer's Web site . . . and look for the most recent modem drivers. The box that they bought off the shelf . . . may have been built six to eight months ago and the manufacturer may have found updates that make things work better in the interim," he says.

Most modem manufacturers include an archive of software updates for their products.

If upgrading your software doesn't work, you'll need to explore other possible causes, some of which may not be entirely obvious. For instance, you may not realize that someone else is picking up the other extension while you're online. Current dial-up technology pushes local telephone networks to their limits and any disturbance can have a negative effect on the connection. We've all heard the slight drop in sound quality that occurs

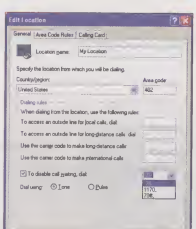
If you're using Win98, select Run from the Start menu, type **sfc** in the field, and press ENTER. Select Extract One File From The Installation Disk and type **c:\windows\winsock.dll** in the Specify The System File You Would Like To Restore field. Click Start and select Browse. Select C:\CABS, C:\WINDOWS\OPTIONS\CABS, or your Win98 installation CD-ROM, and click OK.

Additional help. If you're receiving other error messages not covered here, you can consult Microsoft's Knowledge Base (http://search.support.microsoft.com; click Search The Knowledge Base) for additional tips. Select your OS and provide keywords from your error message for more information.

Downward Spiral. Unfortunately, not all connectivity problems provide error messages. In some instances, you may connect, but at a much slower speed than you should. Or you may connect only to lose your connection without warning.

when we're on the phone and someone picks up the other extension. This slight drop is enough to foul up a dial-up connection.

Call waiting is yet another frequent cause of dropped connections. The slight beep you hear during a conversation can go a long way toward ruining a perfectly good dial-up connection. The solution is to disable call waiting before going online. Most telephone networks include a dialing prefix you can use to disable call waiting.



Adding the proper prefix to the number your ISP (internet service provider) dials can prevent call waiting from knocking you offline.

To use this prefix in Win98 and WinMe, open the Control Panel and double-click Modems. Click the Dialing Properties button, select the checkbox next to To Disable Call Waiting Dial, and select the proper prefix from the drop-down menu or type your own choice. In WinXP, select Phone And Modem Options from the Control Panel (if needed, click Switch To Classic View in left pane first), select the Dialing Rules tab, and click the Edit button. Select the checkbox next to To Disable Call Waiting Dial and select the proper prefix or type your own choice. You can find the proper prefix in your local telephone book.

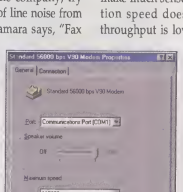
Satellite receivers and digital video recorders often use a telephone line to send billing information back to the provider or download channel guides and other information. If these devices attempt to send information while you're online, it can have the same result as someone picking up another extension.

Slow down. Other times, your dial-up connection may be unstable in other ways. Perhaps you're getting very slow connection speeds when you dial into the network, or perhaps you're getting reasonably fast connection speeds, but data seems to download very slowly. In some instances, a connection may start off responsive but quickly slow to a crawl.

Line noise can cause all sorts of connection problems, including slow connection speeds. Line noise is essentially background noise on the phone line that makes it difficult for modems to hear each other. If you've ever had trouble hearing someone at a noisy restaurant, you can sympathize with your modem. To compensate for a noisy environment, you probably talk louder and slower than you normally would. Modems don't necessarily talk louder, but they do talk slower to compensate for line noise.

Diagnosing line noise and eliminating it can be difficult. A common recommendation in the old days was to connect a phone to the same line as your modem and listen for noise. McNamara says not to bother with this test. "Once [modems] got over 2,400 baud, that was pretty much gone," he says. As we mentioned earlier, dial-up technology pushes the phone network to its limit. This means even an inaudible amount of line noise can cause problems with your connection.

Before you call your phone company, try eliminating possible sources of line noise from within your home. As McNamara says, "Fax machines on the line, answering machines on the line, other telephones on the line; all these things load down the telephone line and can have an impact on the quality of it and how well things are going to connect." Try unplugging all telephone equipment except for the modem and connecting again. If the connection improves, you probably have a device in your home making a little too much noise. You can try plugging devices in one by one and testing your connection until you identify the culprit.



To improve thoroughput, consider setting a slower maximum connection speed. Doing this can improve performance and help prevent data corruption during transmission.

If you're reasonably certain the line noise isn't coming from within your home, the problem is most likely in the phone network that connects you to your ISP. As McNamara points out, most major ISPs in large cities have multiple phone numbers available to their subscribers. If the connection is poor on all three numbers, the odds are very low that the problem is with the ISP.

McNamara recommends trying to isolate the problem by placing a "1" in front of your ISP's phone number and forcing the modem to call long distance. A long distance call will take a different route to your ISP than a local call. "That isolates the entire local telephone company wiring network [and] takes it out of the equation," McNamara says. If your connection improves when you call long distance, the source of the line noise is likely in the wiring between your local telephone company and your ISP's local PoP (Point of Presence). If dialing long distance doesn't improve your connection speed, the problem is most likely in the lines between your home and your telephone company's central office.

McNamara says it's easier to fix problems between you and the central office than it is to get problems between the phone company and the ISP fixed. If you're having problems on your end, you might be able to get the local phone company to examine your telephone line, especially if you tell them you can hear noise on the line.

Sometimes less is more. One strategy for dealing with line noise may not appear to make much sense at first. A modem's connection speed doesn't mean anything if the throughput is low. A connection speed is an estimation of the maximum amount of data the connection is capable of transferring. Throughput is a measurement of the actual amount of data transferring at any given moment.

Under ideal circumstances, higher connection speeds will result in higher throughput, but this isn't always the case. "Sometimes you can lock the modem at a lesser speed and get more throughput from it because the higher speeds become more error-prone." When a modem detects errors, it has to ask the other modem to resend the information. It's a bit like trying to listen to a friend who's talking too fast. The faster they talk, the more you have to ask them to repeat themselves, and the longer it takes them to tell a story. Connection speed goes up, but throughput goes down. "If you have a road full of pot holes, you can't drive a 100mph," says McNamara.

When you've ***tried everything*** *but still continue to have problems, don't be afraid to contact your ISP's technical support department.*

To decrease your connection speed, open the Control Panel and select Modems in Win98/WinMe or Phone And Modem Options in WinXP.

In Win98 and WinMe, select your modem from the list, click the Properties button, and select a lower speed under Maximum Speed. WinXP users need to choose the Modems tab, select their modem, and click the Properties button. Next, choose the Modem tab and select a slower speed under Maximum Port Speed.

■ **DSL.** DSL (Digital Subscriber Line) offers high-speed, always-on Internet connections over existing phone lines. It can also introduce a whole new range of interesting problems.

DSL utilizes previously unused space on copper phone lines to transmit data. Special filters fit between non-DSL phone equipment and your phone lines to prevent interference between voice and data segments of the phone line. "... [with] an old-fashioned ordinary telephone, you may not need to filter that if you can tolerate the degradation in quality that the signal has on it. But when you pick it up, if you dial or especially if it rings with the old energized bell ringing, that could affect your DSL signal," McNamara says. If you need to purchase additional filters, you can often find them at electronic stores for about $5.

Voice traffic, however, isn't the only potential source of data interference. McNamara says "DSL itself is an RF (radio frequency) signal that just rides on the outside of the copper wire." As such, the signal is highly sensitive to other RF traffic in the nearby area, especially lower frequency wireless gear. Halogen lamps, baby monitors, 900MHz phones, and bad electrical transformers are just some of the sources of DSL interference. In some instances, outdoor lighting, even street lights, can cause interference with a DSL connection.

Another common source of interference comes from alarm systems. McNamara says users often overlook such systems and technicians don't always think to ask. The result is hours or even days of on and off troubleshooting before they finally pinpoint the problem.

Occasionally, new DSL customers can be their own worst enemies. McNamara says new customers occasionally will place an order only to place a second order a short time later with a cheaper competitor. Occasionally, things will straighten themselves out, but what often happens is the services cancel each other out and leave the customer with no service. "You should be able to get service almost anywhere in seven to 10 days now. Decide who you want it with, place the order, stay with it, but leave it alone. Let it go through its process."

■ **Ask For Help.** When you've tried everything but still continue to have problems, don't be afraid to contact your ISP's technical support department. As McNamara says, "It's not a bad thing to just think that it may be something [on our end] because it could be, but the odds are pretty good [that] it's going to be something else that we're going to help [customers] address." LS

by Chad Denton

Gateway Or Router?

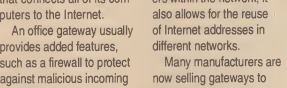
As home networking becomes more and more popular, home users can sometimes become a little confused by technology they have not traditionally needed to know about. For instance, the distinction between a router and a gateway can be confusing for some users.

A **router** can be a hardware or software component that examines incoming packets and routes the packets to their destinations. A router contains a table of other routers it can communicate with, as well as a status of the connection. When a packet arrives, the router picks the best route for the packet to travel based on its destination and the status of the router's connections. The router only examines the destination address and doesn't really care about the contents of the data.

A **gateway** is basically a router with additional features. When you connect to the Internet, you're connecting to a gateway your ISP (Internet service provider) manages. The gateway connects all the users on the ISP's network to the Internet. Your office may have its own gateway that connects all of its computers to the Internet.

An office gateway usually provides added features, such as a firewall to protect against malicious incoming data and a proxy server. While acting as a proxy server, your office gateway accepts requests for information on the Internet from computers within the office network. It strips off the address of the office computer and forwards the data on to the Internet using the gateway's own Internet address. When gateway accepts the requested data, it forwards it on to the computer that made the request. The proxy server not only protects individual computers within the network, it also allows for the reuse of Internet addresses in different networks.

Many manufacturers are now selling gateways to home users. Created primarily for cable and DSL (Digital Subscriber Line) customers, these gateways can connect multiple home PCs to a single Internet connection. Several home gateways also offer firewall features and can act as a proxy server for each PC. □



The NetGear DG814 is an Internet gateway for DSL (Digital Subscriber Line) users. The gateway includes a firewall and the ability to filter Web content.

Time To Tighten Security

Eliminate Common Holes Found In Software You Use While Online

With the growing popularity of always-active broadband connections, including cable and DSL (Digital Subscriber Line), more users are leaving their systems vulnerable to unauthorized access. Much of that intrusion occurs through exposed systems (that is, systems without firewalls), as well as security holes discovered in popular Internet applications such as Microsoft Internet Explorer, Netscape Navigator and Netscape 6, AOL (America Online) Instant Messenger, and others.

Fortunately, there are things you can do to fix security flaws. In this article, we'll discuss some known security threats, tell you how to minimize these threats with a firewall, and suggest some solid tactics you can use to plug the most common security holes.

Understand The Threats. Internet applications (Web browsers, email programs, IM [instant messaging] tools, FTP [File Transfer Protocol] utilities, etc.) establish a communication path from your computer to other computers via the Internet. Ideally, that path is secure and other Internet users cannot access it without your invitation or permission. Although software companies design Internet applications with security in mind, the security these apps provide isn't always perfect. Bugs, malicious design, and even simple oversights have exposed many Internet applications in one way or another.

We don't have room in this article to explore how every security hole works, so we limited our observations in the following section to brief summaries of some recent flaws discovered in several popular applications. Granted, the vulnerabilities we list are certainly not the only holes discovered or fixed, but they serve as a guideline as to the types of trouble that can creep into even the best-designed and tested products. Remember to always check the sites of software developers on a regular basis to download the most recent security patches and updates.

Internet Explorer. IE is perhaps the world's best-known and respected Web browser, but its users and Microsoft have already identified a wide range of vulnerabilities.

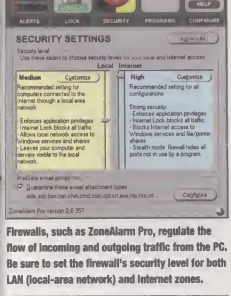
Although Microsoft has developed patches for most of IE's flaws, security researcher Thor Larholm, who now runs his site as part of PivX Solutions' site (http://www.pivx.com/larholm/unpatched), states that there are still many unpatched vulnerabilities left in IE (even in IE6). These vulnerabilities include:

- A weak Java base tag (XMLDSO) may permit arbitrary local file reading, which lets any cracker read files on your PC. As a result, IE6 users are vulnerable just by accessing Web pages that make use of this particular Java base tag.
- Improperly delegated SSL (Secure Sockets Layer) authority may permit HTTPS (Hypertext Transfer Protocol, Secure) Web page **spoofing** (gaining access to a network or network services by posing as a legitimate user), man-in-the-middle attacks, and similar problems. In short, what this means is that an unsavory Webmaster may use these issues to simulate a secure Web page but expose the exchanged data rather than keep it encrypted.
- An improper DNS (Domain Name System) resolution check may lead to a firewall breach. For example, an incorrect domain name (that is, a hacked domain name) might appear as a trusted site and pass by the firewall.
- A self-executing HTML (Hypertext Markup Language) Help application may permit the delivery and execution of arbitrary programs sent by a cracker, and IE6 users are vulnerable just by accessing a Web page that has this HTML Help EXE file embedded in it.

Navigator and Netscape 6. Netscape Communications' Navigator and Netscape 6 products are also popular Web browsers, but they, too, suffer from a number of security holes (many of which Netscape patched in its most recent releases). A few common vulnerabilities include:

- According to GreyMagic Security Research (http://sec.greymagic.com/adv/gm001-ns), a weak Java base tag (XMLHTTP) may permit arbitrary local file reading, which lets any cracker read files stored on your PC (a similar problem in IE6). So, users of Navigator and Netscape versions 6.1 through 6.2.2 are vulnerable if they visit a Web site that includes malicious code and employs this particular tag.
- A flaw (mentioned on Netscape's site at http://wp.netscape.com/security) could let malicious Web site code reveal cookies that another site is storing on a user's computer (reportedly patched in Netscape 6.2.1).
- A weakness in Netscape SmartDownload version 1.3 (also mentioned on Netscape's site at http://wp.netscape.com/security) might let someone use a buffer overflow to execute malicious code on a user's computer.

AIM (AOL Instant Messenger). Millions of Internet users employ IM tools to exchange text, chat, pictures, and other resources with "buddies" across cyberspace. Given the broad presence of AOL on the Internet, its AIM software has become a visible and important IM tool. However, the CVE Web site (Common Vulnerabilities and Exposures; http://www.cve.mitre.org/cve) has identified several AIM issues, including:


ALERTS
LOCK
STOP
SECURITY
PROGRAMS
CONFIGURE
HELP
SECURITY SETTINGS
Advanced
Security level
Use these sliders to choose security levels for your local and internet access
Local
Internet
Medium
Customize
High
Customize
Recommended setting for computers connected to the internet through a local area network
Recommended setting for all configurations
- Enforces application privileges
- Internet Lock blocks all traffic
- Allows local network access to Windows services and shares
- Leaves your computer and services visible to the local network
Stong security:
- Enforces application privileges
- Internet Lock blocks all traffic
- Blocks Internet access to Windows services and file/printer shares
- Stealth mode: firewall hides all ports not in use by a program.
MailSafe e-mail protection
Quarantine these e-mail attachment types:
ade, adp, bas, bat, chm, cmd, com, cpl, crt, exe, hlp, ins, inf ,
Configure
ZoneAlarm Pro version 2.6.357

Firewalls, such as ZoneAlarm Pro, regulate the flow of incoming and outgoing traffic from the PC. Be sure to set the firewall's security level for both LAN (local-area network) and Internet zones.

- A format string vulnerability in AIM 4.1.2010 lets attackers cause a DoS (denial of service) to an IM client and possibly execute arbitrary commands by transferring a file whose name includes format characters.
- A buffer overflow in AIM versions prior to 4.3.2229 lets attackers execute arbitrary commands via a "buddyicon" command.
- A buffer overflow in AIM 4.7.2480, 4.8.2616, and other versions lets remote attackers execute arbitrary code using a long argument in a game request.
- According to SecuriTeam (http://www.securiteam.com/securitynews/5BP020A7FO.html), AIM+ (an add-on for AIM software) contains spyware, which lets the program's author gather users' connection information.

MSN Messenger and Windows Messenger. These products are two similar IM tools that are often integrated with Windows OSes (operating systems). MSN Messenger and Windows Messenger suffer from a number of security issues, but Microsoft provides patches for many of the most serious vulnerabilities. Some of the more notable vulnerabilities include:

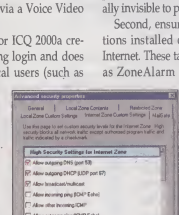
- According to Internetnews.com (http://www.internetnews.com/bus-news/article.php/3851_972241), a bug in MSN Messenger and Windows XP's Windows Messenger can make a user's personal information available to malicious Web site owners.
- The CVE site reported a buffer overflow in the MSN Chat ActiveX control (used in MSN Messenger 4.5 and 4.6, as well as Exchange Instant Messenger 4.5 and 4.6) that lets attackers execute arbitrary code through the MSNChat OCX (an ActiveX object installed with versions of MSN Messenger and Exchange Instant Messenger).
- The CVE site also reports that MSN Messenger lets attackers use JavaScript that references an ActiveX object to obtain sensitive information (including display names, which are generally the same as usernames, and Web site navigation habits) when users access certain sites.

ICQ. ICQ is perhaps the most popular IM, chat, and file exchange tool available today. Although ICQ Inc. has patched many of ICQ's security issues, ICQ users must still contend with several holes. The CVE site offers a lengthy list of issues, including:

- A vulnerability with the ICQ Web server lets remote attackers access arbitrary files outside of the user's personal directory.
- A buffer overflow in ICQ versions prior to the 2001b Beta v5.18 Build #3659 lets attackers execute arbitrary code via a Voice Video & Games request feature.
- The ICQ Webmail client for ICQ 2000a creates a temporary file during login and does not delete it. This lets local users (such as LAN [local-area network] users) obtain potentially sensitive information from the affected system.

Outlook and Outlook Express. Microsoft's Outlook and Outlook Express software have been widely regarded as standard email tools for Windows OSes. But email exchanges provide hackers with a common avenue for spreading viruses and planting Trojan horses on the PCs of unsuspecting users. For example, the CVE site outlines several recent vulnerabilities for Outlook and Outlook Express (many of which Microsoft has patched), including:

- A buffer overflow in Outlook and Outlook Express lets attackers from outside your LAN execute potentially harmful commands using a long Date field in an email header.
- Outlook 98/2000 and Outlook Express 4.0x/5.0x can all potentially let attackers read files on your system using a malformed HTML message that stores files outside of the mail program's cache.
- The Outlook mail client can identify the actual physical path of the sender's machine with a Winmail.dat attachment to RTF (Rich Text Format) files. This lets attackers identify the exact address of your system.



Use personalized settings, such as those found on ZoneAlarm Pro's Internet Zone Custom Settings tab, to optimize security levels for your specific needs.

■ **Plug The Holes.** Although security holes can leave your PC exposed to the Internet, those holes are often surprisingly easy to fix with a combination of firewall protection, application upgrades and patches, and some creative adjustments to each application's security settings. The following sections outline some tactics for protecting your PC and closing the security gaps.

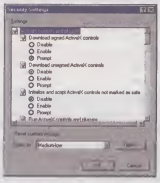
Put up a wall. There are several ways to secure your PC from potential attackers. First, you should try to "hide" the presence of your PC and make it difficult for attackers to find your system in the first place. Firewalls block unused communication ports so your system cannot be "found" by an attacker's random scans for potential targets. This makes your system virtually invisible to potential crackers.

Second, ensure that only approved applications installed on your system are using the Internet. These tasks are ideal for a firewall such as ZoneAlarm Pro from Zone Labs ($39.95; http://www.zonelabs.com). By installing a software-based firewall on your PC, you can prevent all but trusted applications from communicating with the Internet, and prevent any incoming communication that's not from a known and trusted source. An effective firewall will immediately report any unauthorized activity to or from your system and log that activity for future reference. Firewalls also can provide additional features such as the blockade of pop-up ads, cookies, and email attachments.

Firewalls are easy to install: Simply download the self-installing file from the Web site (usually to your Desktop or a specific folder on your hard drive), double-click the file, and follow the on-screen installation instructions to install and configure the firewall. For CD-based firewall products, the installation routine typically will begin automatically after

you insert the CD-ROM into the drive (unless you disabled Windows' AutoRun feature). After installation, you may need to reboot your system so that the firewall loads into memory.

After you install a firewall on your system, you'll need to set its security levels. Firewalls such as ZoneAlarm Pro present users with options they can modify on the application's interface to set the security level for local PCs and Internet access. When you have a few home PCs networked together using the same Internet connection, for example, you can usually set your firewall so its Local security level is Medium (maybe lower) and its Internet security level is High to block unauthorized Internet traffic and hide all ports not being used by an Internet application.



Internet Explorer 6 lets you customize individual parameters for each security level via its Security Settings dialog box.

You also can customize the parameters of each security level to enable or disable particular options without having to opt for an entirely different security level. For example, you can set ZoneAlarm Pro's Internet security level to High but use its custom settings to disallow broadcast/multicast traffic (and by doing so, make ZoneAlarm Pro's Internet security even stricter).

If unexpected traffic arrives from an unknown source, the firewall will alert you of the potential attack. So, for instance, if your ISP (Internet service provider) sends a routine PING (Packet Internet Groper) to determine which of its customers are currently online (as ISPs often do), your firewall may interpret a PING as an attack because it doesn't recognize your ISP (unless you place the ISP's IP [Internet Protocol] address into your firewall's "trusted" list).

In addition, when an application from your computer tries to use the Internet, a firewall will alert you first and ask for your permission. That way, you always know what programs from your system are trying to use the Internet at any given time, and you will quickly see any unexpected or unauthorized programs from inside your system trying to establish a connection. This is an ideal way to spot spyware or Trojan horses that someone may have planted on your system. Because of this, never let unknown or unexpected applications access the Internet from your computer. Manufacturers update firewall products frequently, so for the best protection, check with the firewall manufacturer for periodic patches and updates.

Apply patches. Although software designers invest a tremendous amount of time and effort into creating secure and reliable software, no application is perfect. The examples we discussed previously demonstrate just a handful of instances where bugs and oversights let crackers or malicious Web site designers breach an application's security. It happens, and it's more common than we'd like to admit. Fortunately, software developers are very sensitive to security issues, so when someone identifies a potential security hole, developers often rush to make a patch or update available.

To ensure that you're using the most secure software possible, take the time to check software developers' Web sites for upgrades, particularly for your Internet applications. When a security patch is available, it's usually just a matter of downloading and installing the patch, a process that takes only a few minutes.

For example, Microsoft's Windows Update site (http://windowsupdate.microsoft.com) helps you locate, download, and install security patches for a wide range of Microsoft products. This includes providing critical updates that automatically update core Windows OS components and address known security issues.

If you're using non-Microsoft Internet applications, such as ICQ or AIM, check directly with the software developer for the most recent security updates. This may take a little detective work on your part. In many cases, developers might include security updates in a routine patch that fixes other bugs and streamlines specific functions. For example, you can download the newest version of ICQ (2002a) from http://www.icq.com/products, whereas http://www.icq.com/download/updates.html is where you'll find documentation of the changes and fixes the newest version offers.

Also, please note that although you can download most patches for Internet applications at no change, there may be a few cases where a download isn't possible. For example, the patch may be too large for you to tolerate with a slow dial-up Internet connection. For whatever reason, if you cannot obtain a patch or update, you may need to order an update CD-ROM from the manufacturer (usually for a nominal fee).

Tweak security settings. Although Internet applications generally include acceptable sets of default security settings, there's usually room for adjustment (depending on the way you use each product). Even if you don't change a utility's default settings, it's good to know where the settings are and how to change them if necessary.

Let's use IE6 as an example. After launching IE6, open the Internet Properties dialog box by clicking File, Tools, and Internet Options. From here, choose the Security tab and set the security level for Internet use (general Web browsing), LAN use (other PCs sharing your Internet connection), as well as trusted sites you visit frequently and restricted sites you specifically want to avoid. You can set these security levels using the sliders or click the Custom Level button to tweak particular security actions according to your preferences.

For instance, if you want to ensure that IE6 isn't passing cookies to a Web site (at least without your consent), be sure to select the High security level to disable cookies. However, this also prevents trusted Web sites from saving cookies to your hard drive, and because some site features won't work properly unless you permit cookies, this can be a real hassle if you need to use a site that demands cookies.

If you don't want to deal with the hassle of using the High security level but are concerned about potential security risks (such as unsigned ActiveX controls), click the Custom Level button and adjust the security elements you want to tweak. Here, you can use Custom Level settings to prevent IE6 from downloading unsigned ActiveX controls or at least query you first before downloading them.

(*NOTE: Remember that security options may vary greatly among Internet applications, so always refer to the Help file or software developer's documentation for specific security instructions.*)

■ **Stay Secure.** The security vulnerabilities found in software are a fact of life and can pose a real danger to your sensitive and private information when exploited. However, there are practical ways to protect yourself from unwanted intrusions or malicious Web sites. Always start with a firewall to hide your PC and properly manage Internet traffic. Next, periodically check for security patches and updates for your software. Finally, use the security settings of each Internet software product for additional protection. Security holes are a serious threat, but there are several courses of action you can take to intervene and minimize any negative consequences. LS

by Stephen J. Bigelow

Free & Fee-Based Firewalls

Does Everything Of Value Have A Price Tag?

A full-time broadband connection may be the ultimate for news junkies and gamers, but it is also a great big doorway for online snoopers, script kiddies, and would-be hackers. Firewalls are a permanent part of the online business world, protecting confidential corporate information from digital undesirables. Most small business and home users also are aware of firewalls, both hardware- and software-based, but often wonder if they are getting what they pay for. The underlying question is: Are you paying too much for the same amount of protection that you can get for free?

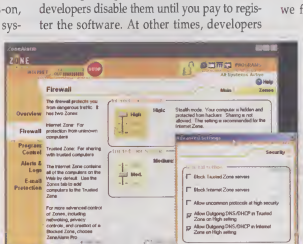
The popularity of personal firewalls continues to increase as full-time online users become better educated about the potential dangers of online exploitation. Many DoS (denial of service) attacks take advantage of always-on, unprotected systems. Hackers find open systems, upload their DoS tools (or other software for making digital mischief), and turn these systems into zombies that basically wait for hackers to return and activate them for attacks on other systems. A personal firewall will go a long way toward preventing this type of unauthorized access, as well as defending against Trojan horses and spyware.

Software-based personal firewalls are applications that run on your PC and monitor incoming and outgoing network traffic. The firewall's job is to watch for any activity to and from your PC that is out of the ordinary or matches a known risk. They also track which applications are sending or receiving packets of data over a network. Based on the rules you define or the level of protection you designate, traffic can either flow automatically without intervention or only flow after you accept each connection the firewall flags (such as services that are not well-known).

Like most software, you have to pay for a license to run a firewall application. There are quite a few commercially available personal firewalls that will provide you with protection against hack attacks and the like, but it may surprise you to know that there are alternatives to paying full price.

In addition to the commercial versions that require payment, many personal firewalls are available as freeware (no charge for personal use) and shareware (try it before you buy it) versions. But like many things in life, sometimes you get what you pay for. More often than not, the freeware or shareware versions don't have all the features that commercial versions have. And sometimes, even though the features might be present in shareware versions, developers disable them until you pay to register the software. At other times, developers may leave features fully enabled in shareware, but configure the trial applications so that they expire and no longer run after a certain number of days, forcing users to uninstall or purchase the software.

Whatever the mechanism, developers offer freeware and shareware as alternatives you can use to try out software before you lay down your cash for the real thing. But as we found, there are fully functioning freeware applications that do their job and do it well.



The ZoneAlarm control panel gives you an easy way to make changes to your firewall setup.

Windows XP's Internet Connection Firewall. A no-cost solution to your broadband security problem is the ICF (Internet Connection Firewall) feature built into WinXP. ICF is a stateful-inspection, packet-filtering firewall. In simple terms, ICF allows outgoing communications that originate from your computer (and the corresponding incoming replies) while blocking everything else. The stateful-inspection engine means it analyzes each packet as it moves through your system and builds a **state table** (a list of current authorized traffic) of the traffic. ICF compares future traffic against the state table and, depending on the rule in place, permits or denies traffic. Many high-end corporate firewalls use a stateful-inspection engine to quickly process and certify traffic to and from a network.

ICF is a single-purpose utility. It can prevent unsolicited TCP/IP (Transmission Control

Protocol/Internet Protocol) scans of your computer (scans are one way hackers find available systems) and avert many Trojan horse attacks that use an initial inbound connection. However, ICF cannot stop Trojan horse attacks when the Trojan horse itself makes the initial outbound connection. To stop this type of attack, you need a good, up-to-date antivirus program. This signifies that for the best Security, personal firewalls and antivirus programs go hand in hand.

Also, unlike some other free and fee-based personal firewalls, ICF doesn't provide scans of attached files in email messages or functions to block Web sites based on **URL (uniform resource locator;** Web address) or IP (Internet Protocol) address. In addition, ICF only recognizes "inside" and "outside" zones. It offers no protection from an attack from the inside trusted zone (your local network). It has some basic logging capabilities, but nothing that would aid you in backtracking a hack attempt.

For a free utility bundled with the OS (operating system), ICF goes a long way toward providing you with some amount of protection right out of the box. If you are running any version of Windows other than WinXP, you don't have access to ICF. But, as we will see next, there are some other alternatives for you, too.

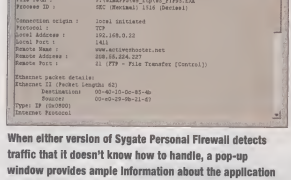
■ **ZoneAlarm Plus & Pro.** One of the most popular personal firewall packages available for consumers to download is ZoneAlarm from Zone Labs (http://www.zonealarm.com). ZoneAlarm comes in three versions, depending on your needs and your budget. The free version shares the same basic firewall engine as the fee-based versions, but it omits many of the more advanced security features.

ZoneAlarm Pro 3.1 comes with the most complete personal security package of all of the ZoneAlarm offerings. For instance, have you ever visited a site that uses pop-up ads? In ZoneAlarm Pro 3.1, you can prevent banner ads and pop-up ads from forcing themselves on you by enabling Pop-up Ad Control. ZoneAlarm Pro also includes a feature called Cookie Control to help you manage your cookies and protect your online privacy. Neither of these two features are available in the other versions of ZoneAlarm.

One of the cooler tools in ZoneAlarm Pro and ZoneAlarm Plus is Hacker Tracking. When a hack attempt comes in, whether by DoS, **Syn Flood** (a type of denial of service attack during which the attacker sends multiple bogus "open" requests to a site), or some other form of attack, Hacker Tracking helps you find and backtrack the source of the attack. You can then give this information to the authorities to try and prosecute the attacker. (Hacker Tracking isn't available in the free version.)

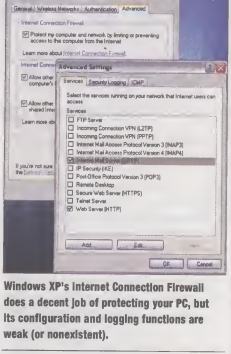
Also shared by ZoneAlarm Pro and Plus are the Advanced MailSafe and Blocked Zone features. Advanced MailSafe looks for 46 file types of email-borne viruses inside email messages, whereas a similar tool found in ZoneAlarm's free version only looks for a single file type. If you already have antivirus software, however, using Advanced MailSafe is a bit redundant.

If you know someone is using a specific Web site or IP address range to target your computer, you can block them using the Blocked Zone feature. But for most home and small-business users, this is a feature that they will probably never use. Why? Well, unless you're aware of repeated attacks on your system from a specific source, chances are you will never know what site or IP address to block.


WS_FTP 95 is trying to connect to www.activehacker.net (208.88.224.227) using remote port 21
FTP File Transfer (Control). Do you want to allow this program to access the network?
Remember my answer and do not ask me again for this application
Yes
No
Detail <<
Detailed information of WS_FTP 95 and the connection it is trying to establish.
File Version : 94, 7, 1, 1
File Description : WS_FTP 95
File Path : F:\WINAPPS\ws_ftp\WS_FTP95.EXE
Process ID : 582 (Normal) 1116 (Normal)
Connection origin : local initiated
Protocol : TCP
Local Address : 192.168.0.22
Local Port : 1411
Remote Name : www.activehacker.net
Remote Address : 208.88.224.227
Remote Port : 21 (FTP - File Transfer [Control])
Ethernet packet details:
Ethernet II (Packet Length= 62)
Destination: 00-40-05-0c-85-4b
Source: 00-e0-29-9b-21-67
Type: IP (0x0800)
Internet Protocol

When either version of Sygate Personal Firewall detects traffic that it doesn't know how to handle, a pop-up window provides ample information about the application and type of connection it's trying to establish.

Should you spend $49.95 on ZoneAlarm Pro 3.1 or simply use the free version? Our recommendation is to at least spend $39.95 on ZoneAlarm Plus to get many of the advanced features found in Pro. Although the free version is better than nothing, it can provide you with a false sense of security if you don't also have an up-to-date antivirus application.



Windows XP's Internet Connection Firewall does a decent job of protecting your PC, but its configuration and logging functions are weak (or nonexistent).

■ **Sygate Personal Firewall.** Another popular personal firewall application is from Sygate Technologies (http://www.sygate.com). There are two versions of the Sygate Personal Firewall: the standard version and the PRO version. Like ZoneAlarm, the standard version is free for personal use but lacks some of the more advanced features found in the PRO version.

Sygate takes a slightly different approach with its two releases. The standard version has all of the features and functions that a home or small-business user needs, without adding more advanced features that corporate users look for. This gives you a solid product without cluttering the interface or providing configuration options that might confuse users who don't need advanced features.

Both versions of Sygate Personal Firewall give you an application-centric firewall. This means you can make your security decisions based on application instead of cryptic TCP/IP port and address information. For example, instead of working with a firewall that gives you the choice of allowing or rejecting something such as "iexplorer.exe on port 80 to access 64.236.24.28 on port 80," you can easily accept or deny a firewall request such as "Internet Explorer is trying to connect to www.msn.com (207.68.172.254) using remote

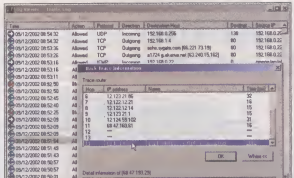
port 80 (HTTP – World Wide Web). . . . Do you want to allow this program to access the network?" instead. Using a firewall capable of communicating in plain English makes it easier to make an informed decision.

In addition, both the PRO and the standard versions of Sygate Personal Firewall include an intrusion detection alarm, traffic logging, policy customization, and the ability to back trace traffic. And we must admit, the intrusion detection alarm is pretty advanced for a free product. This type of alarm will alert you to a possible attack by displaying a pop-up message, flashing a System Tray icon, or sending an email message.

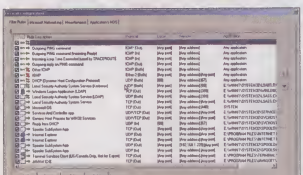
The traffic logging Sygate Personal Firewall provides is also quite extensive, letting you view incoming, outgoing, and blocked traffic. If you see something in the log that looks suspicious or appears tagged as "blocked," you can right-click it and choose Back Trace to find out where it came from. When Back Trace finds the source, you can then perform a WHOIS Internet name search to find out even more information about the attacker.

The PRO version includes VPN (virtual private network) support, a more advanced intrusion detection engine, stealth browsing, and access to more advanced configuration options. Of these features, stealth browsing is really the only one that home users will find useful. This feature prevents your browser from revealing your PC's OS to sites as you Web surf. Stealth browsing also hides your browser version and browser history information from nosy Web site administrators. By hiding your OS and browser version, you take away two more details that hackers can use to exploit your system.

Even without some of the features Sygate Personal Firewall PRO offers, the free standard version of Sygate Personal Firewall is still a great tool to use in the war on personal PC security. It comes with just about everything you need to prevent, control, and log all network and Internet traffic on your PC. Should you spend the money required to get the extra features provided by the PRO version? That depends on your needs, Internet use, and budget. The price tag for the PRO version is $39.95.



You can easily investigate an attack attempt using Sygate Personal Firewall's Traffic Log and Back Trace utility (available in both the standard and PRO versions).



The filter rules in Kerio Personal Firewall not only show you the direction of the traffic, but also indicate the protocol, port, and destination.

■ **Kerio Personal Firewall.** One of the last of the freeware/shareware products available is KPF (Kerio Personal Firewall) by Kerio Technologies (http://www.kerio.com). KPF (the most recent version of which is 2.0) is free for home/personal use and businesses can evaluate it free for 30 days. Like the other personal firewalls we discussed, KPF is a stateful-inspection firewall that sets policies to control the flow of traffic. There is no difference in the free or purchased version ($39.95) of the program other than licensing.

KPF is similar to Sygate Personal Firewall in its overall operation and feature set. You also get application-based policies, but one distinctive feature is configured specifically for Microsoft networks and sets up preconfigured policies to eliminate additional "accept or deny" requests from the firewall. You can configure KPF to let other Windows computers on your network locate each other, and then designate whether these computers can access your shared folders and printers via Microsoft's networking capabilities. This helps control access from inside your trusted domain without modifying your overall policies.

As KPF "learns" what services and applications it should permit or deny, it builds a list of filter rules so you can add, edit, or delete any of the filter rules to meet your specific needs. For example, you can set up a filter rule to only permit traffic from a specific IP address to access your PC on a particular port. You also can request that a pop-up window show you when a rule is met, along with making an entry in the firewall log file. Although it is nice to have some form of logging in KPF, it isn't nearly as useful as the logging Sygate Personal Firewall performs.

A couple of features unique to KPF are its ability to connect to other KPF installations and save and load configuration settings. In a bigger corporate environment, this could be very useful for checking or modifying a user's firewall settings without having to physically access the computer. In this manner, you could block all configuration and monitoring from casual access with the use of usernames and passwords. Again, in a business environment, this could help keep restless employees from playing with their settings and possibly compromising security.

KPF is another good choice among freeware firewalls. Although it doesn't have as many bells and whistles as Sygate Personal Firewall, it does have some unique features.

■ **The Buck Stops Here.** So, which will it be? Free or fee-based firewalls? For personal use, we'd have to say that unless you have a need for some of the more advanced features provided by many fee-based firewalls, the free versions will work just fine. And when considering which free firewall is the most capable among the ones we reviewed, our top choice is the Sygate Personal Firewall. It provides the most features and functionality, and it doesn't sacrifice much in comparison to its fee-based big brother. LS

by Keith Schultz

Minimize Spam

Put Your Inbox On A Junk-Free Diet

If you are seeing more spam in your inbox lately, you are not alone. Unsolicited email, otherwise known as **spam**, has increased from 1,969,041 unique mailings in December 2001 to 4,971,097 in July 2002, according to Brightmail.com.

To put it another way, slightly more than one out of every three messages is probably spam. Jupiter Media Metrix, an industry analyst and research service, predicts that by 2006, the average user will receive more than 1,500 spam messages a year.

Bulk emailers are actively targeting you for product promos, pyramid schemes, scams, and chain letters. You can resign yourself to spending a certain amount of time each day ferreting through your inbox for the important email messages, or you can fight back and let spammers know you won't be trifled with.

Where Does All The Spam Come From? Bulk emailers build mailing lists by purchasing names from legitimate companies, swapping lists with other bulk mailers, and joining bulk mail "clubs" that provide fresh email lists to members on a regular basis. Bulk emailers also use Web crawling programs to automatically scour the Web for email addresses.

Manage Your Spam Intake. The management of spam—and "manage" is the key word because eliminating spam altogether can be difficult, if not impossible—can be divided into three basic categories: avoiding, filtering, and legal methods.

Avoid spam. The content of bulk email lists originates mainly from two sources: online services and online purchases.

When you sign up for a Web-based service, you're usually asked to provide personal information, including your email address. Before you provide this information, check the site's privacy policy. If it doesn't clearly state the information isn't shared or sold, you can assume it will be. Even if the site claims the information isn't shared or sold, don't count on it. Terms of service and privacy policies can be changed at any time, with no warning and often no opportunity to opt out.

Forums (message boards), instant message systems, and chat services are gold mines for collecting email addresses. In some cases, your email address is simply your username appended to the service's domain name, such as *yourname*@yahoo.com. Using these types of services makes you vulnerable to spam, but you can easily deal with it by not using any of these addresses as your primary email address.

Forums present an additional problem. Many include your email address within the message structure. Some provide an email link for each message posted or the ability to view a user profile, which may include your email address. Before using any forum that requires you to sign up with your email address, make sure you can hide that information from public access.

Because you will often need to provide your email address to participate in forums, download a file, or join a chat service, you might consider developing an email management system. With this system, you have multiple email addresses, reserving one as your primary address for personal and/or business correspondence. By using a separate email address for purchases, another for forums, and still others for other services, you can get a better idea of who is distributing your email address. You can take this method to an extreme and use a service such as Sneakemail (http://sneakemail.com) to generate as many email addresses as you need.

Filter spam. Filtering methods are divided into two types: content filtering, which either the user or the user's ISP (Internet service provider) performs; and registration filtering, which the mail originator provides through opt-in or opt-out capabilities.

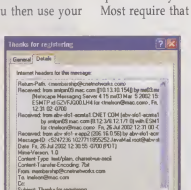
When you sign up for anything on the Web, you should assume you're opting in to an email list. Many sites boast that they send email only to people who choose to receive it; what they fail to mention is that they preconfigure the opt-in option as selected during the sign-up process. If you don't notice or look for the opt-in option and deselect it, you'll add your name to a mailing list.

Opt-out options are usually provided through instructions included in the first mailing. The opt-out method takes advantage of basic human inertia; many people never bother to opt out, which has the same result as making a conscious decision to accept the mail.

Using the opt-out option is sometimes a bad idea because your response lets the bulk emailer know there's a live body on the other end of the email address, making it valuable for him to resell. If you want to opt-out from an email list that you signed up for or one that comes from a company you do business with, by all means, do so. If the email is unsolicited or you don't recognize its origin, don't respond, even if the message claims you can opt out by responding.

Most email clients offer the ability to filter messages. Using built-in filtering systems requires you to create the filters and, more importantly, keep on top of any new spam the filters are not catching, which can be time-consuming.

For additional protection, consider one or more third-party filtering systems. Standalone products access your email server, download messages, and check the headers against the filter list. Messages that match filters are quarantined or deleted. You then use your email client as you normally would and download the remaining messages, which should be spam-free. You can also add new filters based on messages that either get through and shouldn't or don't get through and should. Many of these products are updated with new filters as needed, similar to the updated virus definitions available from antivirus software developers.



To display message headers in Outlook Express, go to File, Properties. Click the Details tab to view message header information, including the Received From path, which can be used to trace the route a message took from the sender to the recipient.

Other filtering systems work as add-ons to your email client, such as Outlook or Outlook Express. An add-on filter offers some simplicity because a single application does all the work. It can also mean giving up some advanced filtering capabilities that Outlook and Outlook Express don't support, such as the ability to bounce spam mail, in essence making the spammer believe the email address doesn't exist.

Look for products that let you create a **friends list** (email addresses you'll always accept mail from) and a **blacklist** (email addresses and even entire domains you'll never accept mail from). The product should also include a method for automatically sending complaint messages to a spammer's ISP.

Legal methods for fighting spam. Federal regulations are needed to ensure uniform Internet mail regulations in all 50 states. Currently, no federal antispam laws have been passed, although there are seven bills in the U.S. House of Representatives and one in the U.S. Senate that deal with regulating spam. None of these bills are expected to pass this year. Most require online marketers to include a working return address and prohibit the use of phony mail headers and misleading subject lines. As antispam activists point out, these bills are weak at best. The bills provide no recourse for recipients, no way for you or your ISP to recoup any losses, and no real regulatory oversight of spam. Even worse, none of these bills require any form of opt-in procedures, only the ability to opt out.

Some state laws take a bigger bite out of spam than any of the proposed federal laws. Most require that unsolicited bulk email include opt-out instructions, the bulk mailer must honor opt-out requests, and no headers or routing information be falsified. In 1997, Nevada became the first state to pass antispam legislation, requiring unsolicited email to include the sender's name, street address, and email address. The message must be labeled an advertisement and no header or routing information may be forged. Messages must contain opt-out information, and opt-out requests must be honored. Delaware currently has the toughest law, making it illegal to send unsolicited bulk mail. It's also illegal in Delaware to use or sell software designed to forge mail headers or routing information.

Most ISP user contracts prohibit bulk email or spam, but not all ISPs enforce this clause. Some ISPs even sell services to known bulk emailers with a wink and a nod. When you receive unsolicited bulk email, you can forward it to the sender's ISP. The specific address to contact varies by ISP, but postmaster@*ISPname*.com, where you replace *ISPname* with the actual name of your ISP, usually works. Because many spammers use forged email addresses, this method is often a waste of time. Using a service such as SpamCop (http://spamcop.net) is generally more effective.

The biggest incentive for spammers is that it costs nothing to send large batches of email; it's ISPs and recipients who pay the price. If spammers had to foot the bill, spam would quickly be reduced to a shadow of its former self. Unfortunately, putting a financial burden on the originator would also end most opt-in email discussion groups and newsletters.

■ **Antispam Tools.** Standalone programs, add-ons, and third-party services can help you get a handle on spam.

iHateSpam v 3.0.323 ($29.95; http://www.sunbelt-software.com) from Sunbelt Software is an add-on for Outlook and Outlook Express. iHateSpam scans your inbox after every mail download and puts spam into a separate folder. When you begin using iHateSpam, examine the spam folder for messages that may be miscategorized. If you find an incorrectly marked message, you can correct its status and update iHateSpam's filters. A copy of any messages recategorized as spam are sent to iHateSpam's Learning Network to be analyzed for future filter updates. You can also add email addresses to the friends list.

Tips To Avoid Spam

Here are a few additional things you can do to combat spam.

Actively opt-out. Registering with the Direct Marketing Association's e-Mail Preference Service (http://www.dmaconsumers.org/offemaillist.html) can help get your name off commercial and nonprofit mailing lists for as long as two years.

Report spam. Send reports about pyramid schemes, multilevel marketing scams, or fraudulent advertising to the FTC (Federal Trade Commission) at uce@ftc.gov. Additional reporting services are available at the National Fraud Information Center (http://www.fraud.org).

Get off public lists. Public online list services, such as the Yellow Pages and White Pages, are a gold mine for bulk emailers. Most of these public services let you edit your listing or remove it completely. Contact each service directly for removal instructions.

Bigfoot (http://www.bigfoot.com) lists email addresses, telephone numbers, and physical addresses, and it provides a map to your address. Contact: overexposure@bigfoot.com.

Switchboard.com (http://www.switchboard.com) lists email addresses, telephone numbers, and physical addresses. Contact: webmaster@switchboard.com. Type the word "**DELETE**" in the subject line of your email.

WhoWhere? (http://www.whowhere.lycos.com/) lists email addresses, telephone numbers, and physical addresses. Contact: delete-entry@whowhere.com.

MailWasher v1.33 beta 2 (free; http://www.mailwasher.net) runs independently of your email client and works with any POP3 (Post Office Protocol) mail server. Support for Web-based email will be added in the future. MailWasher's spam-fighting tools include Bounce, which generates a bounced email message. Many spammers quickly remove invalid email addresses from their lists. Once you select an email to bounce, the sender's information is added to MailWasher's Blacklist, which is a list of email sources that will no longer be accepted.

A user can set up Blacklist entries for automatic bouncing and deletion. He can also configure MailWasher to use other spam blacklists, such as those SpamCop offers. Additional features include a Friends list and a Status function that provides MailWasher's best guess about a message's content (Normal, Chain Letter, Virus, Probably Spam). After using MailWasher to check your email messages, you can then use your email client to download the remaining messages.

Sneakemail (free; http://sneakemail.com) is a simple email anonymizer that lets you create disposable email addresses. Mail sent to a Sneakemail alias is forwarded to your real email account. Sneakemail works best if you use a unique address each time you sign up for a service, make an online purchase, or otherwise provide your email address.

SpamCatcher (free for personal use; http://www.mailshell.com) from Mailshell is a self-learning spam filter that works in collaboration with every other copy of SpamCatcher running on the Internet. The problem with simple spam filters is that spammers constantly change their names, addresses, subject lines, message text, and other information. SpamCatcher creates an anonymous fingerprint of each piece of email you receive and checks the SpamCatcher network to see if the fingerprint matches any known spam. If it does, the message is categorized as spam and handled accordingly. Likewise, when you mark an incoming message as spam that SpamCatcher mistakenly let through, the program creates a fingerprint of that message and sends it anonymously to the SpamCatcher network for analysis and updating. SpamCatcher harnesses the power of millions of messages being filtered in SpamCatcher to create near-real-time filtering updates.

SpamCop (free and paid versions available; http://spamcop.net) is a Web-based service that blocks email addresses known spammers use, and it also hides your true email address. To use SpamCop, first create a SpamCop email address (*yourname*@spamcop.net, for example). You can instruct your ISP to forward all messages to your SpamCop email address. SpamCop will filter your messages and make them available the next time you log on. You can also use your SpamCop email address as your public address. Email sent to SpamCop is filtered, and only the non-spam messages are forwarded to your real email account.

SpamCop goes a step further with the SpamCop reporting tool. If you receive spam, you can notify the sender or the ISP that's being used as a mail relay that you're receiving unwanted mail. Companies that do not respond are added to SpamCop's blacklist of blocked Internet addresses. However, because many spammers route mail through accounts using AOL, Hotmail, and other mail services, you're just as likely to end up with, for example, the entire Hotmail domain blocked, which would prevent any friends with Hotmail accounts from contacting you. Use the reporting tool carefully.

SpamNet Beta 6 (free; http://www.cloudmark.com) from Cloudmark uses a P2P (peer-to-peer) network to track spam and remove it from your inbox. It's not surprising to see the P2P concept in use because John Ritter, one of the creators of Napster, is developing it. SpamNet users mark what they believe are spam messages; when enough SpamNet users agree by flagging the same email message, SpamNet removes the messages from all SpamNet inboxes.

SpamNet is currently a beta release and only works with Outlook. Spam filtering by committee is a new concept. It's too soon to say how well it will work, but it's an interesting use of P2P technology.

SpamKiller 4.0 ($39.95; http://www.mcafee.com) from McAfee.com is a standalone application; you must run it before your email client every time you download mail. SpamKiller includes thousands of preconfigured filters, and you can download filter updates from McAfee.com. You can also add your own filters using a simple New Filter Wizard. You can even filter mail by country, which is handy because many spammers use overseas email systems to route messages.

SpamKiller also lets you fight back by letting you configure it to send bogus bounce messages to items marked as spam. SpamKiller can also look up the sender's email address or domain and send a complaint to the spammer's ISP.

■ **Annoying But Not Illegal.** When all is said and done, it's important to remember that spam isn't illegal. It's annoying and offensive, but it's not yet against the law. Twenty-six states currently have antispam legislation; only Delaware bans spam outright. No federal statutes regulate spam, although there are proposals winding their way through Congress. The FTC (Federal Trade Commission) has at times brought prosecution against spammers, but only for deceptive marketing practices, not spamming. Spam remains a highly profitable enterprise, with little state or federal oversight.

The only lasting way to fight spam is through advocacy and speaking up, letting your state and federal representatives know your feelings. Spam wastes time and consumes bandwidth, which, in the long run, costs you money. In many ways, unsolicited bulk email is theft, plain and simple. LS

by Tom Nelson and Mary O'Connor

Antispam Legislation

The following antispam bills were introduced during 2001 in the 107th Congress:

- **H.R. 95.** Unsolicited Commercial Electronic Mail Act of 2001
- **H.R. 113.** Wireless Telephone Spam Protection Act
- **S. 630.** "CAN SPAM" Act of 2001
- **H.R. 718.** Anti-Spamming Act of 2001
- **H.R. 1017**. Anti-Spamming Act of 2001
- **H.R. 1846.** Who Is E-Mailing Our Kids Act
- **H.R. 2472.** Protect Children From E-Mail Smut Act of 2001
- **H.R. 3146.** Netizens Protection Act of 2001

Additional information is available at The U.S. Senate's Web site (http://www.senate.gov) and the U.S. House of Representatives' Web site (http://www.house.gov), where you'll also find the email addresses of your senators and representatives. Write to them to encourage them to take action on antispam bills. □

Somebody's Watching You

Control Spyware & Adware

The Internet appeals to many people because it seems like an anonymous forum. Enter chat rooms and post to message boards without disclosing your identity. Research medical disorders privately. Avoid embarrassment by researching a topic before discussing it with someone who is already "in the know." It can be a disappointment, then, to learn how little privacy you really have online.

You may have noticed that after visiting certain Web sites or installing certain programs, you experience a corresponding increase in the amount of spam (solicitations or junk email) you receive. Spam can be irritating, but what is often more malicious than the material your computer receives is the data it may secretly send from your system. Many programs contain components that collect data from your computer. You may not even realize that companies are collecting data about your computer activity and browsing habits and sending them through back-channel (background) methods. These data-collecting components are known as adware or spyware.

■ **Adware, Cookies & Spyware** Most adware is incorporated into another program you use. For instance, in one of the better-known adware controversies, RealNetworks' RealJukebox media player kept track of the type of music users listened to in order to market music to them more effectively. Most users had no idea that RealNetworks was collecting information for ad selection. Later in this article, we will cover the way in which RealNetworks resolved the resulting user uproar.

Adware and spyware operate in a similar manner, but spyware is generally more invasive than adware. The difference lies in who ultimately receives your data. If you have visited an online shopping site, browsed other sites in the following days, and then returned to the original shopping site, you may have found it filled with banner ads related to the material you were viewing at other sites recently. It is likely that adware is at work here. The first time you visit the site, it leaves a **cookie** on your computer. Cookies are bits of code that Web sites download to your hard drive. Not all cookies are dangerous; we'll take a look at both types.

Relatively harmless cookies. Most cookies do not collect data. Instead, they simply contain an identifier so the site can recognize you on future visits. For instance, after you enter your username and password on the SmartComputing.com Web site (http://www.smartcomputing.com), if you place a check mark in the checkbox next to Click This Box To Enter Without Having To Type In Your Username And Password Again, your computer will download a cookie. This cookie is harmless and contains no adware. It doesn't collect any personal information about you. Instead, the next time you visit the SmartComputing.com site, the server will locate the cookie on your hard drive and note its identifier. This tells it who you are, so it can automatically log you into the site as the correct user.

Other sites may use the cookie to determine your user preferences and load the news headlines and other information you requested to view on their sites. As you can see, cookies can be very useful tools, and in many cases, they have no adverse affects on your privacy because the only information the site pulls from your hard drive is the identifier on the cookie. Some cookies, however, are not so friendly.

Bad cookies. Some cookies contain more than just an identifier. These cookies can access other cookies on your computer and provide information about the other sites you've visited. When this information is sent back to the originating site, it is used for ad selection and placement. This is why, when you visit a shopping site, you may return days later to find the ads are suspiciously linked to other products, music, and services for which you have

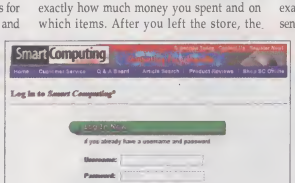
browsed online recently. Using the information the cookie provides about your browsing habits, the site can tailor its ads and promotions to match your interests. Of course, this also means that if you let your 12-year-old daughter use your computer, the next time you shop online, you may see countless ads for discounted rates on Britney Spears albums and *Teen* magazine subscriptions.

Adware. Adware, then, is programmed code that collects information about your browsing habits. It uses that data to alter the content of banner ads, pop-up ads, and promotional offers to contain products in which you are most likely to have an interest. In the case of nonspyware, only the company that downloaded the adware to your system sees your user data.

Spyware. Spyware, on the other hand, collects information that the company can send (and usually sell) to outside companies as "valuable marketing information." This is why, after installing a new program, you may suddenly see an increase in spam, pop-up ads, post-office-delivered junk mail, and even telemarketing calls for a variety of companies not associated with the company from which you received your new software. Companies can also learn more about what types of banner ads successfully solicit a click of the mouse. The distinction between adware and spyware, then, is that while adware collects data for the company's own marketing purposes, spyware collects information, generally without a user's knowledge, so the provider can sell the information to a third party, such as a marketing research firm, an advertising agency, or another corporate entity.

Spyware may also monitor more than just your browsing activity. For instance, it might collect financial information from your personal finance program files. In fact, a clever spyware program could even search for the word "resume" on your system and pull your name, address, phone number, and school and work history from your resume. Some spyware can also hunt down credit card numbers, email and Web site passwords, and other sensitive information. Most spyware, however, is primarily concerned with your browsing activities.

To understand why so many people are up in arms about adware and spyware, imagine that every time you went to the supermarket, someone secretly recorded your actions. Every time you stopped in an aisle to examine an item, someone noted your interest in that product. Each time you bought a prescription drug, the pharmacist made a list of possible illnesses and disorders you might have. At the cash register, detailed records indicated exactly how much money you spent and on which items. After you left the store, the company sold your customer record to a marketing firm. Soon you received junk mail, telemarketing calls, and spam for products that, based on your activities in the supermarket, you might like. Is it 1984? When did Big Brother leave his government job and move into a lucrative career in marketing?



Not all cookies are linked to adware. For instance, when you select a Remember My Password checkbox on a Web site, a cookie doesn't collect personal information. It simply acts as an Identification tag for your computer.

■ **Spying On The Spies.** There are several ways you receive spyware. The most common method is installing it unknowingly as part of another software package. If you download a free Web utility, it might include spyware. The company might make its profit by selling the spyware-collected information to outside agencies. This is why spyware is often bundled with freeware. If a company makes no money from downloads of its software, it probably makes its profits in another way. This isn't to say, however, that all freeware contains spyware. There are many, many respectable freeware programs out there that do not resort to spyware funding. Before downloading new freeware, you can make sure it isn't listed on a site that compiles lists of spyware and adware. Three such sites are Adware, Spyware, And Advertising Trojans (http://cexx.org/adware.htm); Simply The Best (http://www.simplythebest.net/info/spyware.html); and Spychecker.com (http://www.spychecker.com).

It is important to remember that not all data-collection is inherently evil, not all cookies are unwanted beasts, and not all adware is spyware.

You might also receive spyware through a computer virus, Trojan horse, or worm. For example, one of these email nuisances may send itself to everyone in your address book and randomly attach a file from your hard drive to each message. Imagine if such a virus hit a university or large corporation. How many Social Security numbers, credit card numbers, or other types of sensitive data might be distributed to unauthorized users?

Very rarely does a user intend to download or install adware or spyware. Instead, users install useful programs that contain adware or a hidden spyware component. For instance, KMD (KaZaA Media Desktop; http://www.kazaa.com) is a P2P (peer-to-peer) program that lets users share MP3s and other files with each other. However, KMD comes at a cost.

KaZaA bundles Gator eWallet (http://www.gator.com), a password-management program that remembers and automatically enters your passwords at different sites. It sounds handy, right? Well, not exactly. eWallet includes OfferCompanion, a spyware component that tracks your browsing history, including the sites you visit, products you buy, and Gator.com links you click. It reports the information back to Gator, which sells the data to advertisers. Part of the problem with KMD and Gator's spyware is that if you uninstall the Gator utility, KMD no longer works properly.

Another popular piece of freeware that contains adware is Comet Cursor (http://www.cometcursor.com). A Comet Cursor user can replace her browser's pointer with one of more than 4,000 options, such as Kenny from South Park, an American flag, or a favorite pet breed. Comet Cursor also bundles an adware component, which tracks browsing activity. The user is likely to see more pop-up ads and product notices.

You should also watch out for Go!Zilla (http://www.gozilla.com), a utility that accelerates downloads, corrects transmission errors, and lets you resume downloads at a later date. Go!Zilla also installs adware, such as Radiate (formerly Aureate), which launches many banner ads on a user's computer. Radiate remains on your system even after a user uninstalls Go!Zilla.

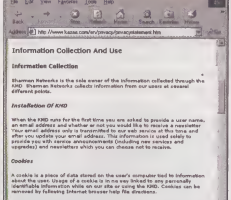
An Ounce Of Prevention. There are several ways to protect your privacy and reduce or eliminate the amount of adware that creeps onto your system. First, we'll look at the ways you can do this without spending extra money or download time. Then we will look at some software that can help you protect your privacy.

Start by configuring your browser to operate with a heightened level of security. Most browsers can limit the types of cookies they accept, and many will also notify you before downloading a cookie. In Internet Explorer, you can change the cookie settings. Click the Tools menu, Internet Options, and the Privacy tab. Drag the slider bar to the desired security level. Read the descriptions of each security level and select the one you want. You can block all cookies, accept all cookies, or take a more moderate approach to cookie crumbling. You may also want to occasionally delete cookies. You can do this by right-clicking Start and clicking Explore. Find and double-click the Windows folder and then the Cookies folder. Select and delete any cookies you don't recognize.

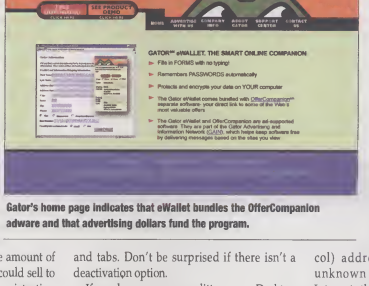
You can avoid much adware and spyware by carefully reading the licensing agreement for any software before installing it. You should also read all Readme documents before using a new program. Many licensing agreements or Readme files include a privacy policy that explains what data is gathered and for what purposes. In some instances, the agreement may also include information about how to deactivate an adware component. When you register software, enter only the required information. This way you limit the amount of personal data a spyware company could sell to a marketing agency. Also, if the registration form gives you the option to receive special announcements and offers, deselect these options, because they usually lead to large amounts of spam.

If you've already installed a program containing adware or spyware, check the program's user guide, help topics, and Web site to see if you can turn off the adware component. Often the adware deactivation option (if there is one) is placed in a relatively obscure location, such as under several dialog windows and tabs. Don't be surprised if there isn't a deactivation option.

If you know a program litters your Desktop with ads, you should think twice before installing that program. If these ads are pop-up ads, you will probably experience a drop in productivity as you take time from computing to close pop-up ads. If the program places ads directly on your Desktop (rather than launching pop-up ads), you should exercise increased caution. Although some such programs simply place ads, many also track browsing activity to sell to outside advertisers who compete for space on your Desktop.



Before downloading or installing software, read the company's privacy statement, such as this one for KaZaA KMD.


"LESS TYPING, FASTER SHOPPING
MAKES CYBERSHOPPING A ONE-CLICK AFFAIR."
The Gator comparison
SEE PRODUCT DEMO
GATOR™ eWALLET, THE SMART ONLINE COMPANION
Fills in FORMS with no typing!
Remembers PASSWORDS automatically
Protects and encrypts your data on YOUR computer
The Gator eWallet comes bundled with OfferCompanion™, separate software operated by select Web sites of the Web's most valuable offers.
The Gator eWallet and OfferCompanion are ad-supported software. They are part of the Gator Advertising and Information Network (GAIN), which helps keep software free by delivering messages based on the sites you view.

Gator's home page indicates that eWallet bundles the OfferCompanion adware and that advertising dollars fund the program.

Software Required. With many users concerned about Internet privacy, there are many programs to help you fend off adware and spyware. Some of these lessen the effect of adware, some halt data transmission, and some actually remove spyware from your system.

Patches and nonadware versions. Start with the easiest software remedy: patches and updates. Check the software manufacturer's Web site for updates to the program that contains the adware. After the uproar surrounding the RealJukebox adware, RealNetworks posted a patch that let users turn off the adware component.

Similar programs. Many times a user gets attached to one program and never realizes that other companies make comparable (and often highly competitive) packages. If your software includes a spyware component, look for another program that accomplishes the same task.

Firewalls. One of the best ways to avoid spyware is to install a firewall. There are many firewalls available. Zone Labs' ZoneAlarm Pro 3.1 ($49.95; http://www.zonelabs.com) is one of the most popular. This firewall not only warns you when your computer attempts to access the Internet to receive or send files, but it also keeps a log of all the programs that sent a command to connect to the Internet. This log can help you track down the offending adware or spyware programs.

When a program on your system attempts to access the Internet, a firewall displays an application alert. This generally tells you which program requested the connection, at what time, and to what IP (Internet Protocol) address. If the firewall shows an unknown program trying to access the Internet, there's a good chance the file is an adware component of another program. An example would be if you installed KMD but didn't realize it came with Gator's OfferCompanion. When the adware tried to access the Internet, you would see an application alert for OfferCompanion, a program you didn't know you had.

It's also possible that you would recognize a program name but not know why it would need to access the Internet at that point in time. Although there might be another

explanation, this is often an indication that adware or spyware might be connected to the program. A firewall not only shows you which programs attempt Internet connections, but it also prompts you for permission before allowing the connection.

Firewalls often let you continue to use a useful application without suffering the consequences of its spyware component. In addition to ZoneAlarm, there are many other firewalls, such as Symantec Norton Personal Firewall 2002 ($49.95; http://www.symantec.com), Symantec Norton Internet Security 2002 ($69.95), and Tiny Personal Firewall 3.0 ($39; http://www.tinysoftware.com). If you are not attached to your current Web browser, you could check out a download such as FlowProtector (http://www.checkflow.net/usa/downloadfinal.htm). This is a browser that includes its own firewall.

Other utilities. Just as you can use an antivirus utility to scan your drives for known viruses, you can use a program such as Lavasoft's Ad-aware 5.83 (freeware; http://www.lavasoftusa.com) to scan your system for known spyware. Ad-aware notifies you if it finds any spyware and prompts you to uninstall it. If you're concerned about compromising the associated host program's ability to function, you can choose to leave the spyware on your system but have Ad-aware log its activities. If you choose to uninstall the spyware, Ad-aware will remove it for you. Ad-aware backs up your system before performing an uninstall, so if removing the spyware component causes problems, you can restore your system to a previous state.

Ad-aware can also eliminate advertising-related cookies. Ad-aware is a free download, so if you're looking for a way to wipe spyware from your system, a visit to Lavasoft's Web site might be well worth your time. You will need to return to the site, though, to download updates that address newly developed spyware.

Remember that some spyware comes in the form of a virus, worm, or other nasty bit of code. Stay up to date with your security updates and download the most recent patches for your antivirus software. This will help you avoid many viruses that steal or share your files.

Uninstall the program. If you can't deactivate the adware component or find a way to neutralize its effects, you may need to uninstall the program with which it came. Obviously, if you use the offending program, this may not be an appealing option. If you don't mind the personal data leaving your computer but simply want to stop viewing annoying pop-up ads, you might try installing a program such as RedV PopUpProtector Pro ($19.95; http://www.popupprotector.com), which prevents browser windows from automatically launching themselves.

However, you may need to actually uninstall the adware-related program. In Windows 98 and Windows Me, click Start, Settings, and Control Panel. Double-click Add/Remove Programs. Click to highlight the program you want to remove and click the Add/Remove button. Click Yes to remove the program. In Windows XP, click Start, Control Panel, and Add Or Remove Programs. Click the Change/Remove button for the program containing the adware. Click Yes to remove the program.

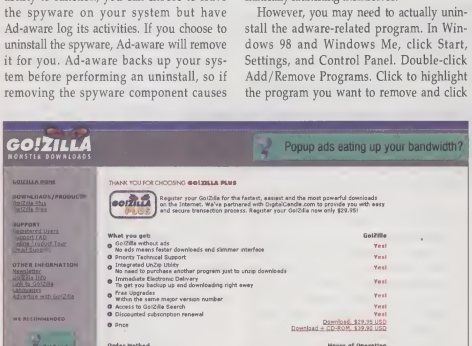
Be aware, though, that some programs cease to run properly after you uninstall their adware components. If you can't locate the spyware component, you may need to uninstall the entire application, including the main program. After you uninstall the program, check its application folder to see if any other files or programs are left. In the case of some programs, such as GoIZilla, removing the main application doesn't remove the adware component.

■ **The Future Of Adware & Spyware.** In 2000 and 2001, North Carolina Sen. John Edwards introduced bills to make under-the-radar data-collection software illegal. These bills, which would have required software companies to inform users when software included adware or spyware components, did not pass in either session. In April 2002, South Carolina Sen. Ernest Hollings introduced S.2201, a new online privacy bill. At press time, this bill was still pending.

If Hollings' bill passes, it will make it illegal for ISPs (Internet service providers) and commercial Web sites to collect information, such as names and addresses, without explicitly warning the user first. The provider must receive consent to collect and distribute a user's personal information, must indicate how to opt out of the adware (if that is an option), and notify users of any policy changes. Users must also be able to view the information the provider collects, and the provider must ensure that the personal data remains confidential from those other than the parties intended to receive the information. If you are concerned about your online privacy, let your senator know that you want legislative protection from adware.

Adware and spyware will likely be around for a long time because many people make a lot of money off of such data collection. You may very well be concerned about your privacy. By taking some of the steps we covered, however, you should be able to limit or even halt the data such software collects about your computing activities. LS

by Kylee Dickey



Some companies offer nonadware versions of their software. One example is GoIZilla. The adware version is a free download. The nonadware version costs $29.95 to download.

Hard Drive Dilemmas

Solutions To Your Startup & Performance Troubles

As you probably know, your computer's hard drive is its main data storage unit. It holds a mass of information, ranging from the Windows OS (operating system), to software programs, to data files. Today's hard drives hold more information than ever, and they are relatively trouble-free. However, they can and do fail.

To help you learn what can go wrong with your hard drive, we have identified problems and solutions for typical hard drive startup and performance troubles. Note that in outlining the problems and solutions that follow, we assume you have not recently upgraded your OS or added a new drive. Because upgrades introduce a different set of problems, refer to the documentation that accompanies your new OS or hard drive for recommended solutions.

■ **Hard Drive Basics.** Before we start, let's further define the hard drive and its components. The hard drive consists of platters, a motor that spins the platters, and read/write heads that are attached to an arm and controlled by an actuator.

The hard drive interfaces with a system's motherboard through a disk controller, which is built into the motherboard or housed in an adapter card installed in an expansion slot. A data cable attaches the hard drive to the disk controller. A power supply connector channels electricity from the power supply directly to the hard drive.

Current hard drives come in two varieties: IDE/ATA (Integrated Drive Electronics/Advanced Technology Attachment) or SCSI (Small Computer System Interface). Both technologies support multiple drive types including hard drives, CD-ROMs, and tape drives.

Desktop and notebook PCs almost always use IDE/ATA hard drives. Most motherboards include two integrated IDE/ATA disk controllers; one is primary and the other secondary. Because each of these controllers supports as many as two devices, your PC needs a way to differentiate between them. This is accomplished with the use of small jumpers or switches on the drive that generally labels the drive as a master or slave. The master drive is the main drive on the IDE/ATA connection, whether one or two drives are attached. If two drives are connected, the master controls the second drive. Consequently, the second drive becomes the slave. Your system uses the master/slave configuration to route communications and determine which drive to boot from, with the master hard drive on the primary IDE/ATA controller being the first drive it checks.

SCSI drives are less common, and they are mainly installed in servers. Compared to an IDE/ATA drive, a SCSI drive is more expensive, but it offers additional speed and flexibility. The drive attaches to a cable that can accommodate additional SCSI devices, and the linked devices are called a SCSI chain. Depending on the system, the cable handles as many as seven or as many as 15 devices in addition to the SCSI disk controller. Each device, including the disk controller, must have a unique ID number. Also, the devices at the beginning and end of the cable must be electrically terminated.

Now, let's examine some common hard drive dilemmas, beginning with startup issues.

■ **Stuck At Startup.** When you turn on your PC, you expect to see the familiar sequence of screens and the Windows logo. If that doesn't happen, review our startup problems and solutions for guidance.

Problem: My hard drive is no longer spinning.

Solution: If you can't hear the platters inside the hard drive spinning, check that the external power connections are OK. Turn off your PC and all attached peripherals, such as the monitor and printer, and confirm that the electrical outlet you're using has power by plugging in another electronic device. Assuming the outlet has power, unplug the power cord from the back of your computer and reconnect it, making sure the cord is fully seated.

Turn on your computer. If you still can't hear the platters spinning, the problem is probably due to a bad or loose internal power connection. To verify this, turn off your computer and remove the case. To prevent ESD (electrostatic discharge), which can damage your computer's sensitive electronic components, touch an unpainted metal surface at the back of the computer to ground yourself. For additional protection, consider purchasing an antistatic wrist strap, which provides a continual grounding path for static electric charges.

Once you are grounded, locate the hard drive and find the power connector. The connector in many PCs is white and contains four colored wires. If you're using a SCSI drive, the connector is probably attached to the disk controller.

Grasp the power supply connector, not the wires, and disconnect it from the drive. If it doesn't detach easily, wiggle it laterally with

gentle force. Next, reattach the connector so it is fully seated and restart your computer.

If, after reattaching the power connection, the hard drive still doesn't spin, your power connector, power supply, or hard drive may be faulty. If you are comfortable swapping these components on a working PC, you may be able to isolate the problem. Otherwise, contact a qualified technician to perform this task.

Problem: A system error message appears during startup.

Solution: Messages about a missing OS, nonsystem disk error, or boot error are alarming. These errors normally mean your computer cannot find a disk with the OS. The reasons for this can range from a simple connection issue to a catastrophic hard drive failure.

First, check all floppy diskette, CD, and DVD drives and remove any media you find. Restart your computer to determine whether this resolves the problem. If it doesn't, check your computer's hard drive for viruses. Some viruses infect the boot record of your hard drive, resulting in startup problems.

When you are unable to start your computer, running a virus scan is a bit tricky. Specific procedures depend upon your antivirus software and version of Windows. Your best bet is to turn off the PC, go to a working computer, and check your antivirus software's Web site for further instructions. For Norton AntiVirus, go to http://www.symantec.com/nav. For McAfee VirusScan, check http://www.mcafee.com. Look for instructions that detail how to perform a virus scan when you are unable to boot your PC or access the antivirus software. Even if your PC does not use these antivirus software products, information on their Web sites can help.

If a complete virus scan doesn't identify a problem, a hardware connection or configuration issue may be the culprit. Check your PC's hard drive connections and configuration.

Problem: A drive or controller error displays during startup.

Solution: Drive and controller errors normally indicate a problem with hardware connections, jumpers, or cables. Accordingly, troubleshooting steps depend on whether your hard drive is an IDE/ATA or SCSI drive.

For the IDE/ATA and SCSI drives, the first step is to turn off your PC and remove the case. As you work inside the computer, periodically ground yourself.

Next, proceed to the following sections according to your drive type. When instructed to attach and reattach connectors, grasp the connector, not the cable or wires, and wiggle it laterally with gentle force. When reattaching a connector, make sure it is fully seated and all pins line up correctly.

Check IDE/ATA drives. Detach the data ribbon cable from the hard drive, examine the pins, and if they look fine, reconnect the cable. Make sure to connect the colored wire to Pin 1 of the hard drive. If Pin 1 isn't marked, check your system documentation to confirm its location. Also, detach, inspect, and reattach the opposite end of the cable to the disk controller on the motherboard or adapter card. Next, examine the ribbon cable wires to make sure they are not damaged; look for cuts, nicks, or sharp folds. If you think the cable is damaged, replace it.

After checking the data ribbon cable, restart your PC. If it still does not boot properly, check the master/slave drive configuration. Small jumpers or switches on the back edge or bottom of the hard drive designate whether it is the only drive attached to the disk controller or one of two attached drives. Because the settings differ according to manufacturer, check your system documentation for specifics.

After verifying the master/slave drive configuration, replace the case and restart your PC. If the problem is not resolved, restart again and enter the BIOS (Basic Input/Output System) setup screen. This screen appears when you press a specific key, such as DELETE or F2, during the boot process. If you are not sure of the key you need to press, check your system documentation.

This cutaway image of a Western Digital hard drive shows one of three platters, a read/write head, and the actuator. You can also see the 40-pin connector on the left for the data ribbon cable and the 4-pin power supply connector on the right. Photo courtesy of Western Digital.

After you access the BIOS setup screen, verify that the primary IDE/ATA controller is enabled in the BIOS settings. Next, look for a hard drive autodetect feature. Use this feature (if available) to determine whether the BIOS can locate and identify the hard drive. If the BIOS utility cannot locate the hard drive, the drive has probably failed. Check your manufacturer's warranty for a replacement policy.

If the BIOS can identify the hard drive, but the system still does not boot, check your system documentation to determine whether your PC manufacturer includes a diagnostics floppy or CD. Many vendors include a set of diagnostics for troubleshooting system problems.

For additional assistance or if you can't locate diagnostic tools, contact the manufacturer.

Check SCSI drives. Most hardware issues related to SCSI drives are caused by incorrect SCSI device ID numbers, improper termination settings, or a conflict with another device in the SCSI chain.

To begin troubleshooting, verify that each SCSI device has a unique ID number. The ID may be assigned through hardware settings, such as jumpers or switches, or through a software utility included with the device. The numbers should range from 0 to 7 or 0 to 15, depending on the capabilities of the disk controller and SCSI data cable.

After verifying the ID numbers, restart the PC. If the problem still occurs, check the termination settings for each device. Only the devices at the beginning and the end of the cable should terminate. Some devices automatically detect whether they are at the end of the SCSI chain and others use jumpers or plug-in resistors for termination.

Next, check the SCSI data cable. Make sure it is properly seated in the host adapter and all attached devices, including the hard drive. Also look for damaged cable wires or connection pins; replace the cable if you suspect damage.

After examining the cable, restart your PC. If it doesn't start up, the hard drive may be conflicting with another SCSI device. If you are comfortable with configuring the SCSI chain to accommodate only the hard drive, try that. Or, if the manufacturer includes a diagnostics floppy or CD for troubleshooting system problems, try using it to test your system.

If you are unable to find a solution to the problem, check your manufacturer's warranty for a replacement policy and contact its support

services for further assistance. Also, for more information on replacing hard drives, see "Out Of Space?" on page 138.

■ **Performance Predicaments.** If your PC's performance is degrading or exhibits an increasing number of intermittent problems, a failing hard drive may be the cause. Although performance problems are hard to diagnose, Windows 98/Me/XP include tools to help you identify, correct, and prevent hard drive troubles.

Problem: Files are garbled, PC intermittently reboots, or PC frequently locks up.

Solution: First, fully scan your system for viruses. A common symptom of a virus infection is intermittent problems such as these. If the virus scan gives your system a clean bill of health, the next step is to check for defective areas on the hard drive, known as **bad sectors**. Windows OSes include tools that detect, repair, and mark bad sectors on your hard drive.

To check your drive's integrity in Win98/Me, run the ScanDisk tool. Click Start, select Programs, Accessories, System Tools, and click ScanDisk. In the ScanDisk dialog box, select the hard drive to check and click Thorough in the Type Of Test area. Next, click the Options button to display the Surface Scan Options dialog box. Select the System And Data Areas radio button, clear all other items, and then click OK to return to the ScanDisk dialog box.

Click the Advanced button on the ScanDisk dialog box to view additional options. You may want to select Always under the Display Summary area to force Win98/Me to always display the ScanDisk results. To track whether bad sectors increase over time, select Append To Log under the Log File area. This creates a continuous record of results. Finally, to recover problem files, select Make Copies under the Cross-Linked Files area and Convert To Files in the Lost File Fragments area. Recovered files are labeled with the CHK file extension in the hard drive's root directory, usually C:\, with names such as File0001.chk and File0002.chk. Open these files in Notepad and to try to salvage text or data.

Click the OK button on the Advanced Options dialog box to return to the ScanDisk dialog box. Next, select the Automatically Fix Errors option, close all open applications, and then click the Start button.

WinXP doesn't include ScanDisk. Instead, Microsoft replaced ScanDisk with Check Disk, a tool based on the Chkdsk command line utility. Because WinXP is based on Windows NT and Windows 2000 technology and is theoretically more reliable than Win98/Me, Check Disk is more straightforward and contains fewer options than ScanDisk.

To run Check Disk in WinXP, open My Computer in the Start menu, right-click the drive you want to check, and click Properties. On the Tools tab, click the Check Now button. In the Check Disk Options area of the next dialog box, perform a full system scan by selecting the Scan For And Attempt Recovery Of Bad Sectors option, and click the Start button. If the drive is in use, WinXP will indicate that you must restart your PC to run the utility. Click the Yes button so Check Disk runs the next time you start your computer. Click OK to close the Properties dialog box, close all open applications, and then restart your computer. If you don't see the message about restarting your computer after you click the Start button, WinXP will immediately begin checking the drive.

When the disk checking process is complete, Win98/Me displays the results on the screen and saves them to the Scandisk.log file in the root directory of the scanned drive. In WinXP, the results display briefly or not at all if you didn't need to restart your PC. However, the Event Viewer records the results. To open the Event Viewer, click Start, Control Panel, Performance And Maintenance, Administrative Tools, and double-click Event Viewer. On the left side of the split screen, click Application. The right side displays a list of events, in order of newest to oldest. Open each item, starting at the top of the list until you find the event that contains the Check Disk results.

For all OSes, review the log information and determine whether the hard drive has more than a typical amount of bad sectors. A small number is normal. Bad sectors that take up more than 5% of a drive's capacity are cause for concern. Back up your data and consult a technician to determine whether to replace the drive.

Problem: An error message displays when attempting to save a file to the hard drive.

Solution: First, so you don't lose your work, try saving the file to a floppy or a different location. Next, run ScanDisk (Win98/Me) or Check Disk (WinXP) to check the drive's condition.

If the scan doesn't identify a problem, power down the PC and check all external connections. If everything is correctly connected, check the internal connections for the hard drive, power supply, controller, and cabling, as previously described in the Stuck At Start-up section.

A number of cables attach to the hard drive. Here you can see the colored wires and white connector for the power supply and the data ribbon cable. Damaged or poorly connected cables can cause a variety of system errors.

Problem: Consistently slower than usual hard drive response.

Solution: Run ScanDisk (Win98/Me) or Check Disk (WinXP) to check the hard drive's condition. If the scan doesn't identify a problem, a cluttered or fragmented hard drive might be causing the slower performance.

To keep your hard drive running efficiently, Win98/Me/XP offer the Disk Cleanup and Disk Defragmenter utilities. Run Disk Cleanup to remove unnecessary files and programs. Then run Disk Defragmenter to organize the remaining files on the drive and optimize performance.

■ **A Healthy Hard Drive.** To avoid hard drive ills, routinely run the ScanDisk/Check Disk, Disk Cleanup, and Disk Defragmenter utilities, along with a full virus scan. Windows makes this easy with the Task Scheduler in Win98/Me/XP. To start the Task Scheduler in WinXP, click Start, Control Panel, Performance And Maintenance, and Scheduled Tasks. In Win98/Me, open Control Panel and click the Scheduled Tasks icon. For the Maintenance Wizard in Win98/Me, click Start, Programs, Accessories, System Tools, and then Maintenance Wizard.

Even if your hard drive starts to hiccup, don't panic. The problem may be as simple as a loose connection or bad cable. And if you maintain current backups, you have peace of mind, even if your hard drive fails. Companies that specialize in data recovery can work miracles, but they are not free and a full recovery isn't guaranteed. Consequently, our final words of advice are simple and predictable: Back up. LS

by Carmen Carmack

The Dreaded Error Message

How To Minimize The Occurrence Of Windows Errors

For many Windows users, error messages are an irritating and often baffling way of life. These messages, which inform the user of a problem with system operation and often force him either to terminate the program or reboot the machine altogether, have become so ubiquitous to Windows operation that spoof Web sites have even sprung up that list humorous, nonexistent errors.

Although a fake error message that says, "Your System Is Low On Resources. You Haven't Spent Enough Money On Software Yet" may be amusing, a real error message is not, especially if it occurs frequently or causes substantial data loss. If a seemingly endless stream of error messages plagues you during Windows operation, take heart. There are several steps you can take to minimize the occurrence of errors in Windows. There also are proven solutions to help you resolve the problems that do occur.

In this article, we will discuss the most common (according to Microsoft technicians) error messages and their solutions and refer you to Microsoft resources that can help you with the less common ones. We will also provide insight into what error messages mean, why they occur, and how you can prevent them. With this information in store, you can begin eliminating these pesky and often detrimental tidbits from your computing diet.

■ **A History Of Error.** Error messages are found in all versions of Windows, up to Windows XP. In early versions of Windows, the dreaded BSOD (Blue Screen of Death) was most common. Here, the entire screen would go blank (bright blue) and the error message would be written in large white letters in the center. With the BSOD, if the user were lucky, he would be able to terminate the offending program (and lose all unsaved information). If he were unlucky, he would have to reboot his computer and pray that it operated normally afterward.

BSODs still occur in Win98 and Windows Me; one even nabbed Microsoft Chairman Bill Gates during a public presentation of Win98 during the spring 1998 Comdex in Chicago. They are also possible, although unlikely, in WinXP. However, as Windows has evolved, small, less threatening text boxes that pop up on-screen have replaced BSODs in most cases. This is especially true in WinXP, where less serious errors have become less informative and more friendly. For example, one error says, "Microsoft Word has encountered a problem and needs to close. We are sorry for the inconvenience." In cases where a problem is serious enough for WinXP to freeze, however, errors look much like those of earlier versions but have been renamed Stop errors.

The good news about error messages is that they have also become less damaging. With the release of WinMe, Microsoft took real steps to assist users with errors, incorporating a System Restore feature that lets the system, upon restart, return to a point before the error message occurred. WinMe (and WinXP, which followed it) also made it easier for users to update or disable device drivers during troubleshooting. With the release of WinXP, Microsoft went even further, adding a system to warn users before they install hardware or software that has not been tested with WinXP. In addition, extensive testing and frequent product updates help curtail the incidence of error messages.

This focus on device drivers and product testing in WinXP is not accidental; most technical experts agree that conflicting third-party device drivers and software is the leading cause of error messages. Thousands of programs and products are designed to run under Windows, and many touted as being "Windows compatible" are actually not compatible at all. Other common culprits include viruses (especially the W32.Blebla.B.Worm, W32.navidad, and W32/Sircam viruses) and insufficient (or damaged) RAM. Both afflictions alter the system's ability to perform the many tasks users request of it.

■ **Set Yourself Free.** System Restore and incompatibility warnings are nice touches, but they are all designed to remove offending products from your system. That won't help much if the programs you need to run on your system aren't compatible. And if you're using Win98, you won't have these tools at your disposal, even if you want to use them. Consequently, until the day (which will probably never come) that Windows hardware and software is 100% Windows-compatible, you'll be dealing with error messages.

You can, however, minimize the occurrence of error messages. First of all, purchase software and hardware that is proven to work with Windows. This is easiest for users of WinXP, who need only look for the Designed for Windows XP logo. If no suitable products bear this logo, users should refer to the Windows Catalog (http://www.microsoft.com/windows/catalog) that contains an exhaustive list of products that were tested with WinXP.

WinMe and Win98 users do not have these resources at their command. Instead, they should focus on using brand name products from major manufacturers. Ask friends and

associates for recommendations of products they have found work well with Windows. Do not assume that a product that states it is "Windows Compatible" automatically will be.

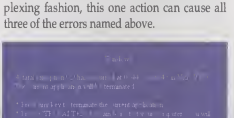
If you already have a product on your system that you suspect is causing problems and you do not want to uninstall it, try to find a more compatible driver. Consult the manufacturer of the product or visit a device driver Web site, such as Driver Guide (http://www.driverguide.com) for assistance.

Also, keep your system up to date, both with good virus software and the latest patches and fixes from the Windows Update site (http://windowsupdate.microsoft.com). This is particularly important for users of recent versions of Windows. In WinXP, for example, Service Pack 1 incorporated fixes for more than 300 bugs and problems that were causing error messages. For a list of the error messages Service Pack 1 addresses, visit the Microsoft Knowledge Base at http://support.microsoft.com. Under Search The Knowledge Base in the left-hand pane, type the keywords "**Categorized List of Fixes in Windows XP Service Pack 1**" and press the arrow button.

Finally, make sure you have enough RAM installed in your computer. RAM is so inexpensive now that there is no reason not to have enough. Users should consider Microsoft's recommended RAM requirements for Windows minimums because many software products require extra RAM to run well. For Win98 users, the magical *minimum* number is 64MB of RAM. For WinMe and WinXP users, it's 128MB. If you are receiving error messages and you have sufficient RAM, portions of your RAM may be failing. Faulty RAM is particularly suspect when fatal exception errors occur during Win98 or WinMe setup. Microsoft Knowledge Base articles Q138788 and Q293299 offer information on determining whether bad RAM is causing error messages.

■ **Ongoing Investigation.** If you are receiving a specific error message on a regular basis, you should be able to isolate its cause and resolve the problem. However, unless you are an advanced user, there is not much you can glean from knowing which type of error has occurred and why it has happened. Error messages fall into several categories, with the most common being exception errors (also fatal exception errors), illegal operation errors, and kernel errors. Both illegal operation errors and kernel errors generally result from a type of error called an invalid page fault, which occurs when a Windows program crosses an illogical or unauthorized boundary within the system.

Nearly all errors, including the three types listed above, occur because one component of the system (generally software) attempted to do something that another component of the system recognized as unauthorized or illegal. The most common unauthorized action is an attempt to access an invalid memory address (the name given by the system to specific locations on a memory chip). In traditionally perplexing fashion, this one action can cause all three of the errors named above.



The dreaded BSOD (Blue Screen of Death) has plagued users of Windows for nearly a decade.

Instead of spending your time trying to learn the meanings of these obscure messages, you should focus on preventing them as discussed above and using documented solutions to avoid their occurrence in the future. In this section, we will detail some of the most commonly reported (and most threatening) error messages that occur in Win98 and WinMe, along with their causes and solutions. In the next section, we will discuss some of the problems that crop up in WinXP. In the final section, we will offer hints for troubleshooting error messages other than the ones detailed here.

Error messages at startup or when Internet applications are run (Win98). Some of the most common error messages in Win98 relate to a missing or damaged Winsock file:Wsock32.dll. Startup messages that relate to this file include:

- "Explorer caused an exception C06D007EH in module Sens.dll"
- "Aoltray caused an Invalid Page Fault in Module Wsock32.dll at <memory location>"
- "Spool32 caused an Invalid Page Fault in Module Spoolss.dll at 0167:7FACD02E"
- "There is not enough memory to start Wsock32.dll"

Messages may also occur when the user connects to the Internet, starts AOL (America Online), or runs Internet Explorer. If you are receiving messages at any of these times or if you are receiving a message that contains any reference to Wsock32.dll, you should reinstall this file.

Cause: The Wsock32.dll file can become corrupted or deleted in a number of ways, including the installation or removal of Internet-related software. Some viruses can also remove this file.

Solution: First, ensure that your PC isn't infected with a virus. If you do not own virus protection software, Trend Micro's HouseCall (http://housecall.antivirus.com) can scan your system at no charge. If you do not have any viruses, or if removing active viruses does not eliminate the problem, you should replace your Winsock file.

From the Start menu, click Run, and type **sfc** in the Open field in the Run dialog box, and click OK. In the System File Checker dialog box, click the Extract One File From Installation Disk radio button, type **Wsock32.dll** in the Specify The System File You Would Like To Restore field, and click Start. Insert your Win98 CD into your CD drive. In the Extract File dialog box, type *drive*:**Win98** in the Restore From field, where *drive* is the drive letter of your CD-ROM. Click OK. In the Backup File dialog box, click OK. If a message appears that reads "The backup folder does not exist. Do you want to create it," click Yes. When you are prompted to extract the file, click Yes to restart the computer.

"Error Loading Explorer.exe" message at Windows Startup (Win98 and WinMe). When a user starts Windows, he receives the error message above and the instruction to reinstall Windows. Upon clicking OK, a black screen appears and Windows will not restart.

Cause: The Explorer.exe system file is missing or damaged.

Solution: Update the Explorer.exe file with a replacement copy from the CAB files (Windows' name for compressed backup system files) on the Windows installation CD. To do this when Windows will not restart, you must use a text-based version of the Windows system file extraction tool.

Start the computer using the system startup disk you created during Setup. When the startup dialog box appears, select Start Computer With CD-ROM Support and press ENTER. Insert the installation CD into the CD drive.

At the command prompt (A:\), type **C:** and press ENTER. At the command prompt

(C:\) type Ext and press ENTER. This starts the Windows file extraction utility. At the "Please Enter The Path To The Windows CAB Files" prompt, type *drive*:\win98 (Win98) or *drive*:\win9x (WinMe), replacing *drive* with the letter of your CD-ROM drive. Press ENTER. At the "Please Enter The Name(s) Of The Files You Want To Extract" prompt, type **Explorer.exe** and press ENTER. At the Please Enter The Path To Extract To prompt, type **C:\Windows** (*the path of the new file*). At the "Is This Okay? (Y/N)" prompt, type **Y** (yes) and press ENTER.

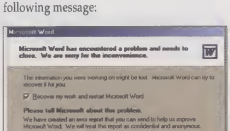
Out of memory error messages or system freezes during startup with large amounts of RAM installed (Win98 and WinMe).

Despite the axiom that you can never have enough RAM, having too much can also cause problems in Win98 and WinMe. If you have more than 512MB of RAM and are experiencing problems during startup, the excessive RAM may be the culprit. One error message in particular that relates to this problem is the one that says, "Insufficient memory to initialize windows. Quit one or more memory-resident programs or remove unnecessary utilities from your Config .sys and Autoexec.bat files, and restart your computer."

Cause: With large amounts of memory installed, Windows may create a memory cache (for virtual memory) that is so large it consumes all the available system memory addresses. This leaves no virtual memory addresses for other functions. This problem is most frequently seen in computers that have AGP (Advanced Graphics Port) video cards, which require memory addresses, as well.

Solution: Use the MaxFileCache setting in the Windows System.ini file to reduce the amount of memory that the virtual memory cache (Vcache) can use to 512MB or less. From the Start menu, click Find, Files And Folders, type **System.ini** in the Named field, click the Find Now button, and note its location. Next, select Programs, Accessories, and Notepad to open the Windows text editor. Open the System.ini file and scroll to the [VCache] section. Change the MaxFileCache= setting to 524288 (524,288KB, which is 512MB) or less.

You receive an error message using the Disk Defragmenter (Win98 and WinMe). When you use the Disk Defragmenter to optimize your hard drive, you may receive the following message:


Microsoft Word
Microsoft Word has encountered a problem and needs to close. We are sorry for the inconvenience.
The information you were working on might be lost. Microsoft Word can try to recover it for you.
Recover my work and restart Microsoft Word
Please tell Microsoft about this problem.
We have created an error report that you can send to help us improve Microsoft Word. We will treat this report as confidential and anonymous.
To see what data the error report contains, click here.
Send Error Report
Don't Send

Most error messages are less threatening than the BSOD (Blue Screen of Death), and some Windows XP messages even offer an apology.

The first Windows XP Service Pack addressed more than 300 known problems and their related error messages.

"Drive's Contents Have Changed: Restarting . . ."

Cause: This problem occurs when other programs, particularly antivirus software or screen savers, were running during the defragmenting process.

Solution: If you run Disk Defragmenter in Safe Mode, you won't have to worry about background programs that may be running. Restart your computer, then press and hold the CTRL key until the Startup menu appears. Choose Safe Mode from the menu. Run the Disk Defragmenter again and restart the computer normally.

"System Restore was unable to create a restore point" error message (WinMe). This can be one of the most disconcerting messages for a WinMe user to receive because it means his system's protective mechanism is not doing its job. The specific message, which occurs when a user attempts to use the System Restore utility to create a restore point, is "System Restore was unable to create a restore point. Please restart your computer and run System Restore again." However, restarting the computer does not solve the problem. In addition, attempts to restore the computer to an earlier time may be fruitless because there may be no earlier restore points available.

Cause: If the system Registry (the file that stores all your system settings) becomes corrupt or damaged, it will prevent the creation of restore points.

Solution: You can solve this problem by restoring a working backup copy of your Registry using a text-based version of the Windows Registry Checker tool. Restart your computer, press and holding the F8 key as soon as you see a message that indicates Windows is starting. When the Windows 98 Startup Menu appears, select the option for MS-DOS mode—Command Prompt Only. At the command prompt (C:\) type **cd\windows\command** and press ENTER. If you have named your Windows folder anything other than Windows, substitute the correct name. At the next command prompt (C:\windows\command), type **scanreg/restore** and press ENTER. From the list in the text box that appears, select the most recent working Registry .CAB file and then choose Restore (you may need to use the Up or Down arrow keys on your keyboard to perform these tasks). You can identify working files by the presence of the word "Started" next to the date. You will lose any system changes that have occurred since this date.

After you are notified that you have restored a properly functioning Registry, press ENTER. This will restart your computer. Once your computer reboots, you will be able to create a Restore Point. From the Start menu, select Programs, Accessories, System Tools, and System Restore. Select Create A Restore Point from the options on the right side.

Black screen or error message at startup or when you use Internet Explorer (WinMe). When you start your computer or browse the Internet, your

screen turns black, IE quits, or you receive an error message beginning "ERROR: OE: 0028:" or "ERROR: 0D: 0246" followed by a string of eight characters.

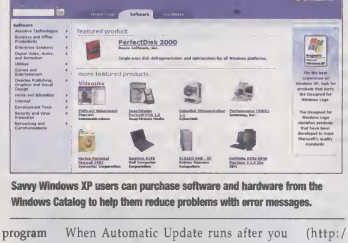
Cause: A number of things can cause this error, ranging from software or driver conflicts to damaged DUN (dial-up networking) files. However, if IE has worked in the past and is now causing problems, the culprit is most likely either a damaged installation of IE or a conflict with a recently installed program or hardware.

Solution: Begin by repairing your installation of IE. From the Start menu, select Settings, Control Panel, and double-click Add/Remove Programs. Select Microsoft Internet Explorer and Internet Tools and click Add/Remove. Select Repair Internet Explorer, then click OK. When prompted, choose Yes to enable the repair to proceed. Restart your computer when prompted.

If this does not solve the problem, uninstall any recently installed programs (especially antivirus and firewall programs) or revert your system to a restore point prior to their installation. If this solves the problem, check with the manufacturer of the software for updates to make it compatible with WinMe and IE. If the problem persists, check with the manufacturer of any recently installed hardware for new WinMe drivers. If one is available, update it. From the Start menu, select Settings, Control Panel, and double-click System. Click the Device Manager tab and double-click the branch that relates to the problematic hardware, such as Modems or Network Adapters. Select the component you want to update and click Properties, then Update Driver. Follow the prompts to install the new driver.

If the problem still persists, you may need to uninstall and reinstall IE, TCP/IP (Transmission Control Protocol/Internet Protocol) and DUN, or possibly even WinMe. Refer to Microsoft Knowledge Base articles Q264194, Q286748, and Q277648 respectively for further assistance.

Error message when running the Automatic Update feature (WinMe). Beginning with WinMe, Windows offers an Automatic Update feature that runs in the background when you are on the Internet.



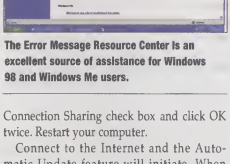
Savvy Windows XP users can purchase software and hardware from the Windows Catalog to help them reduce problems with error messages.

When Automatic Update runs after you upgrade to WinMe, you may receive the following error message:

"WUAUCLT has caused an error in *unknown* WUAUCLT will now close"

Cause: This problem occurs in computers that had ICS (Internet Connection Sharing) installed prior to upgrading to WinMe.

Solution: To resolve this problem, uninstall ICS, perform the update, and reinstall ICS. From the Start menu, choose Settings, Control Panel, and Add/Remove Programs. On the Windows Setup tab, choose Communications, then Details. Clear the Internet



The Error Message Resource Center is an excellent source of assistance for Windows 98 and Windows Me users.

Connection Sharing check box and click OK twice. Restart your computer.

Connect to the Internet and the Automatic Update feature will initiate. When prompted to do so, accept the Automatic Updates End User License Agreement. Now, perform the steps listed above but this time, place a check mark in the ICS check box. Follow the instructions the Home Networking Wizard provides.

Automatic Updates has been associated with other problems and errors in WinMe. If you prefer, you can disable Automatic Updates and perform updates manually. To do so, open the Start menu and choose Settings, Control Panel, and Automatic Updates. Check the third option, Turn Off Automatic Updating. I Will Update My Computer Manually. To update your computer, connect to the Internet and open your Web browser. Access the Windows Update Web site (http://v4.windowsupdate.microsoft.com), and click Scan for Updates. When the necessary updates are located, you will be given the option of choosing those you wish to install.

■ **Brave New World.** As mentioned earlier, Microsoft went to great lengths to reduce the incidence of errors in WinXP and resolved more than 300 of the outstanding ones in its first Service Pack. Consequently, although minor errors relating to specific programs (especially Microsoft Word) are not unusual, the most serious errors (Stop errors) occur much less frequently. This is particularly true for users that follow Microsoft's guidelines and avoid installing unsupported hardware and software. Those careful users will probably encounter a Stop error or other fatal error only during a WinXP upgrade. Some of the more common errors are outlined here.

"Stop 0x0000000A Irql_Not_Less_or_Equal" error message during a WinXP upgrade. When you upgrade your computer from Win98 or WinMe to WinXP, you may receive the following error message: "Stop 0x0000000A Irql_Not_Less_or_Equal.

The upgrade will then terminate or the system will freeze.

Cause: This error occurs if the PC on which the upgrade is being performed uses incompatible hardware, software, or device drivers.

Solution: Restart your computer; if you are given the option to revert to your previous system, accept it. When the computer restarts, uninstall any antivirus or boot manager software you are using and perform a **clean boot** (a startup with the minimal operating files need for system operation) of your system. After the clean boot startup,

reinstall WinXP. For instructions on performing a clean boot, refer to Microsoft Knowledge Base articles Q192926 (Win98) or Q267288 (WinMe).

If this does not solve the problem, the conflict may be hardware related. Check the WinXP hardware compatibility Web site mentioned earlier and see if all your devices are supported. Contact the manufacturer of all the devices in your computer, including internal devices such as network adapters and sound cards, for updated WinXP drivers. If the problem persists, contact the manufacturer of your PC for assistance.

■ Fatal error messages and failure of WinXP upgrade. You receive error messages during upgrade other than the one mentioned above and the upgrade terminates. The messages may include the following:

Error: Cannot get main entry point for C:\WIDOWSSYTEM\VIPERSTI.CPL.

Error:127 {ERROR=127 (7Fh)}

Error: The signature for Windows XP *edition* Setup is invalid. The error code is ffffffd0. The system cannot find message text for message number 0xffffffd0 in the message file for Syssetup.dll.

Fatal Error: Setup failed to install the product catalogs. This is a fatal error. The setup log files should contain more information.

Error: Warning! Setup failed to remove the setup catalog ieexcep.cat

Error: Warning! Setup failed to remove the setup catalog sp1.cat

You cannot complete the upgrade installation.

Cause: This problem is a confirmed problem with some versions of WinXP. It occurs because WinXP fails to remove certain conflicting files that were present in the previous version of Windows.

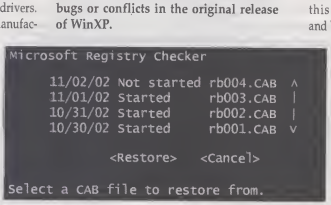
Solution: To eliminate this conflict, restart the Windows upgrade process. When the first error message occurs, press **Shift-F10** to generate a command prompt. At the command prompt, type **cd\windows\system32**, and press ENTER. Type **rename catroot2 catold** and press ENTER. This will rename the folder that WinXP has failed to delete. Restart the computer and finish the upgrade.

■ Failure of WinXP upgrade with error messages or instructions to contact technical support. During your WinXP upgrade, you receive one of the following error messages:

"Setup Cannot Continue. Please Contact Microsoft Technical Support. (Error: 3E6h).

WINNT32 this program has performed an illegal operation. WINNT32 caused an invalid page fault in module KERNEL32.DLL"

Cause: A number of issues cause this problem, all of which are related to bugs or conflicts in the original release of WinXP.



When a corrupt Registry prevents Windows from restarting, users can use a text-based version of the Registry Checker tool, Scanreg.exe, to restore a working copy of the Registry.

Solution: To resolve this problem, connect to the Internet and run WinXP Setup. When you are prompted to do so, choose Yes, Download The Updated Setup Files (Recommended) during Setup. The Dynamic Update feature will download the latest WinXP Service Pack and should resolve your problems.

If this does not work, try uninstalling all the software programs currently on your computer. Upgrade to WinXP and reinstall them. You should also check with the manufacturer of both the software and hardware on your PC to obtain the latest updates for WinXP.

■ A World Of Trouble. The 10 error messages discussed here may be the most common, but they only scratch the surface of the thousands of messages that occur. If you find your system falling prey to errors and problems other than the ones discussed here, a number of resources and procedures can help.

1. Clean Boot Your System: The clean boot process discussed above is a good way to eliminate old, potentially problematic files on your system whenever trouble crops up. You should refer to Microsoft's Knowledge Base articles Q192926 (Win98), Q267288 (WinMe), or Q316434 (WinXP) for further assistance.
2. System Restore: If you are using WinMe or WinXP and have recently changed your computer's configuration, try returning your computer to an earlier point and see if this resolves the problem. If it does, you know that the recent changes are causing the error messages. (The instructions for using System Restore given earlier in this article are valid for both WinMe and WinXP.)
3. Use the Knowledge Base: The Knowledge Base contains information on every error message that users have reported and Microsoft technicians have solved. Use the error message you receive as the keyword in your query, and you should be able to access an article relating to your problem. WinMe and Win98 users should also visit the Error Message Resource Center (Microsoft Knowledge Base article Q315854) for assistance. WinXP users will find help with troubleshooting Setup problems at Knowledge Base article Q310064. For assistance with hardware and software troubleshooting, refer to Knowledge Base article Q322205.

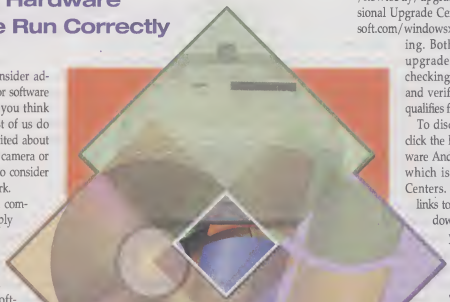
■ A Perfect Solution? Error messages are becoming less frequent with each release of Windows, and the information to prevent and resolve them is becoming ever more exhaustive. Will error messages ever go away? Given the complexity of PCs and the vast number of companies that design products for them, the chances are slim.

Jim Allchin, Microsoft's group vice president, platforms, is one person who thinks the PC of the future will be much more trouble-free. He envisions a day when PCs operate just like any other home electronic component. He does warn users, however, that this evolution cannot happen without their input. Speaking of his home PC, Allchin notes, "It starts too slowly and has too many reboots. The TV doesn't have to be rebooted, and you've never installed a service pack on the VCR. These are just a long list of issues that together we need to work on." LS

by Jennifer Farwell

Prevent Common Compatibility Conundrums

Make Your Hardware & Software Run Correctly



Whenever you consider adding hardware or software to your PC, do you think about compatibility? Most of us do not. Usually, we're so excited about installing our new digital camera or game that we don't stop to consider whether it will actually work.

Although it may sound complex, compatibility is simply a matter of coordinating the three main parts of a computer system: the OS (operating system), the hardware, and the software. Compatibility problems can arise when you change one of these components without first doing your homework.

To help you avoid problems, we'll tell you how to prevent common compatibility issues in Windows 98, Windows Me, and Windows XP. We start with upgrading earlier OSes to WinXP and then move on to adding hardware or software to an existing Win98, WinMe, or WinXP system.

■ **Upgrade To WinXP.** If you are upgrading to WinXP from Win98/Me, you may discover compatibility problems with some of your existing software and hardware. The WinXP kernel, which controls baseline functions such as memory and drive management, is based on Windows NT and Windows 2000. Because the WinNT/2000 OSes are very different from Win98/Me, compatibility issues are common.

Know what you have. Before you can check your system for compatibility with WinXP, you should know how to find details about the software and hardware installed on your PC. To find software version information, simply open the program, click the Help menu, and then click About. The version number of the software should display.

For hardware details, check the Device Manager. To access the Device Manager in WinXP, click Start, right-click My Computer, and click Manage. Click Device Manager in the left pane of the Computer Management dialog box to display a list of device categories in the right pane. Click the plus signs (+) to expand the categories for specific hardware information. You can also right-click a device and click Properties for additional details.

To start the Device Manager in Win98/Me, click Start, Settings, and Control Panel, double-click the System icon, and click the Device Manager tab. Like in WinXP, you can click the plus signs to expand the categories, and then right-click a device and click Properties for more details about the device.

Check out the Upgrade Center. If you're using Win98/Me, you can upgrade to WinXP Home or WinXP Professional. To decide which edition to choose, answer the five questions at Microsoft's Windows XP Web site (http://www.microsoft.com/windowsxp/whichxp.asp).

After you determine which edition is best for you, visit the WinXP Home Upgrade Center at http://www.microsoft.com/windowsxp/home/howtobuy/upgrading or the WinXP Professional Upgrade Center at http://www.microsoft.com/windowsxp/pro/howtobuy/upgrading. Both sites list four steps for upgrade preparation, including checking the system requirements and verifying that your current OS qualifies for an upgrade.

To discover compatibility issues, click the link Make Sure Your Hardware And Software Are Compatible, which is Step 3 in both Upgrade Centers. The resulting page offers links to two helpful tools: the Windows Catalog Web site, where you can search for WinXP-compatible hardware and software, and the Upgrade Advisor.

The Upgrade Advisor is a particularly effective tool that you download and run on your PC. It checks all of the hardware and software on your computer and reports compatibility issues that it finds, explaining what to do to resolve the issues. Unfortunately, the Upgrade Advisor is a very large file, and you should download it only if you have a high-speed Internet connection. The tool is also included on the WinXP Setup CD under the Check System Compatibility option. If you have a dial-up connection or are otherwise unable to download the Upgrade Advisor, be sure to run the Check System Compatibility option prior to installing WinXP. After running the tool, pay careful attention to any compatibility issues it reports.

Software slip ups. If you have problems with software after you complete the WinXP upgrade, you may simply need to uninstall and then reinstall the software. When uninstalling software, be sure to use the Control Panel's Add Or Remove Programs option (click Start, Control Panel). If reinstallation does not resolve the problem, check the manufacturer's Web site

for WinXP compatibility issues and recommended solutions.

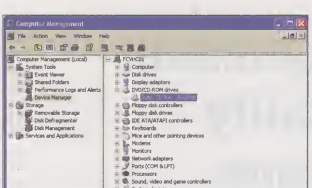
If you're unable to run older games or other software designed specifically for previous Windows OSes, WinXP offers a Compatibility Mode feature that may solve the problem. With this feature, you can configure WinXP to act as an earlier OS when it runs a certain software application. Note that some software programs, especially system tools, are designed to interact with specific OSes at the kernel level. The kernel is the foundation of an OS and provides basic services for the system. Because this interaction is on such a low level, the Compatibility Mode is unable to compensate. For example, if you were running Symantec's Norton AntiVirus 2001 on a WinMe system, you must purchase and install Norton AntiVirus 2003 when you upgrade to WinXP. If you are uncertain about whether you must obtain a software upgrade for WinXP compatibility, check the manufacturer's Web site.

The easiest way to set the correct Compatibility Mode for a software program in WinXP is with the Program Compatibility Wizard. To open the wizard, click Start, point to All Programs, point to Accessories, and then click Program Compatibility Wizard. Follow the on-screen instructions to select and test the appropriate Windows OS and compatibility settings. For additional instructions, refer to Microsoft Knowledge Base article Q301911 on Microsoft's Product Support Services Web site (http://support.microsoft.com).

Hardware headaches. If a hardware device is not working properly after you upgrade to WinXP, first check the device driver. A device driver is software that facilitates communications between a hardware device and the OS.

To check for an updated driver, start with the Windows Update Web site (http://windowsupdate.microsoft.com). Click Scan For Updates and click Driver Updates. The first time you use Windows Update, you may be asked to install software from Microsoft to facilitate a system configuration scan. The service scans your system so it reports only those updates your PC needs. Install the system configuration software if prompted to do so. After Windows Update scans your system, it displays a list of any updated drivers it finds. You can then pick and choose which drivers to automatically download and install.

If Windows Update does not locate a driver, check the hardware manufacturer's Web site.



The Device Manager is available in Windows 98, Windows Me, and Windows XP. It's a handy way to find details about your existing hardware, and you can use it to work with hardware device drivers.

Make sure any drivers you download are compatible with WinXP and look for the vendor's installation instructions. Many vendors place drivers in self-extracting or compressed files, which you must extract or decompress after downloading.

When installing a new driver, if you see a warning message stating the driver is not signed, it may not be compatible with WinXP. Suspend the installation and contact the manufacturer for assistance. Microsoft uses a digital signature to certify the driver was tested for compatibility with WinXP, and an unsigned driver is worth questioning.

Now that we have covered what can happen when you upgrade your OS to WinXP, let's examine how to prevent compatibility problems when you want to add hardware to your existing system.

■ **Help With Hardware Changes.** Before you add hardware to your PC, you need to conduct a bit of compatibility research. To help you with this process, we explain where to look for compatibility information for old and new hardware.

Install old hardware. Perhaps you're wondering whether that digital camera you bought two years ago will work on a new WinXP computer, or maybe you found a good deal on a used laser printer. If you can connect to the Internet, you can uncover current hardware compatibility information through a number of online resources.

For WinXP, try searching the Windows Catalog page (http://www.windowscatalog.com). Vendors have certified or Microsoft has tested the products listed on this page. Products with a "Designed For Windows" logo or designation are built specifically to work with WinXP. Products listed as compatible with WinXP will also function but may not make full use of WinXP's features.

Another resource is Microsoft's Hardware Compatibility List site (http://www.microsoft.com/hwdq/hcl). This site reports compatibility for multiple OSes, including Win98/Me/XP. To use the site, type the manufacturer's name in the Search For field. For the In field, click the arrow on the right and select the product category, such as Storage/CD-RW or Imaging/Scanner, from the drop-down list. If you're not certain of the proper category, select All Product Categories. Click the Search Now button to begin the search. When the search is complete, a grid displays with a list of products that match your search criteria.

The Hardware Compatibility List uses icons to indicate the nature of each product's compatibility with various OSes. For descriptions of each icon, click the Legend link in the paragraph above the results grid. In addition, clicking a product in the list provides more details.

Even if you don't find a hardware device in the Windows Catalog or Windows Hardware Compatibility List, it may be compatible with your system. Check the manufacturer's Web site and look for the device's technical specifications or system requirements. Additionally, check for and download any drivers necessary for the device to operate correctly with your OS. And be sure to follow the manufacturer's instructions for hardware and driver installation.

Install new hardware. If you are thinking about adding new hardware to your existing system, first verify whether your PC meets all product requirements, including the Windows OS version. You can generally find this information on the product's technical specifications or system requirements Web page. You can also search the Windows Hardware Compatibility List as previously described.

Thankfully, most hardware made today is compatible with WinXP and backward compatible with older Windows OSes. This means most vendors are currently designing their products to run on earlier versions of Windows, such as Win98 and Me, in addition to WinXP. Windows 95 is the exception to this rule. Many PC product vendors have stopped supporting Win95.

Also, check the device's other system specifications, such as memory, CPU speed, and interface requirements. If you're considering a digital camera that only supports a USB (Universal

Serial Bus) interface, for instance, it won't work on an older PC that doesn't have a USB port.

Solve hardware installation problems. Since the release of Win95, all Windows OSes include support for PnP (Plug and Play) technology. This technology is designed to simplify the process of adding hardware, and most hardware devices manufactured since 1995 are PnP.

In addition to PnP support, Win98/Me/XP automatically include many drivers. When you add PnP-compatible hardware to your PC, Windows usually configures the device and installs the appropriate driver automatically. If the manufacturer included a driver CD or floppy diskette, you may need to use it to install the device. As always, follow the manufacturer's instructions for installation.

If the manufacturer's instructions don't work or Windows does not automatically detect a hardware device, try the Add New Hardware Wizard. To use the wizard in Win98/Me, click Start, Settings, Control Panel, and double-click Add New Hardware. When you click the Next button in the wizard, Win98/Me searches for new PnP devices and displays a list of any it finds. If the device is listed, click the Yes radio button, select the device from the list, click Next, and follow the on-screen instructions to complete installation. If the device is not listed, click No and click the Next button to continue. From here, you can let Win98/Me search for non-PnP devices, or you can click No and Next again to define the hardware information yourself.

The Add Hardware Wizard in WinXP is more streamlined than the Win98/Me wizard. To begin, make sure you are logged in as a user with administrator authority. Next, click Start, Control Panel, and Printers And Other Hardware. Under the See Also heading on the left, click Add Hardware to display the wizard's first screen. When you click the Next button, WinXP searches for and installs any new PnP devices.

If the wizard does not find a PnP device, it displays a list of the currently installed hardware. Scroll to the bottom of the list, click Add A New Hardware Device, and click the Next button. Follow the on-screen prompts to complete installation. If the manufacturer supplied a floppy or CD with the appropriate driver, click the Have Disk button when the wizard prompts you for driver installation.

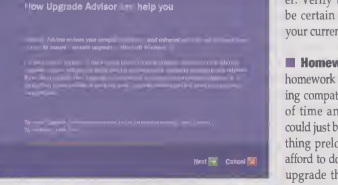
During installation, the Add Hardware Wizard may detect a device conflict, meaning that two hardware devices are attempting to use the same resources. If this occurs, the wizard will notify you so you can use the Device Manager to troubleshoot the problem. For details about device conflict troubleshooting in Win98/Me, search for article Q133240 in Microsoft's Knowledge Base. For WinXP, search for article Q310126.

■ **Streamline Software Installation.** As with hardware additions, you should verify the system requirements for any software you want to install on your existing computer system. What's more, software products are often designed to work with a specific OS. You may find that older software will not run at all on WinXP or that you may need to fine-tune your system to make it work.

Install old software. The first step is to verify whether the software will work on your PC's current configuration. For current information, check the manufacturer's Web site for compatibility lists, as well as any downloadable software patches you might need. A patch is an update to the software that corrects known issues, such as compatibility problems.

If the manufacturer suggests that you purchase a full software upgrade, heed this advice. Certain system-level utilities, such as virus detection or CD-burning software, are designed to work with a specific OS, and you may have to pay for the appropriate upgrade.

Assuming you don't need an upgrade and the software can run on your system, proceed with installation. Note that WinXP differs significantly from Win98/Me. Among other things, WinXP's system folders are in different locations and the OS supports multiple users. For these reasons, make sure you are logged in as an administrator and that all other users are logged off prior to starting the installation.



The Upgrade Advisor, which is the same as the Check System Compatibility tool on the Windows XP Setup CD, checks your system and reports compatibility problems before you upgrade to WinXP. The report is stored in the Upgrade.txt file in the C:\WINDOWS folder.

If you have difficulty installing older software on WinXP, try using the Compatibility Mode tool. In addition to running programs in Compatibility Mode, you can use this tool to install older software. To do so, locate the installation file (usually Setup.exe) on the floppy or CD, right-click it, click Properties, and then click the Compatibility tab. In the Compatibility Mode area, select the Windows version the software was designed for, which should be in the original product packaging or documentation.

After installing the software and following the manufacturer's instructions for installing any necessary patches or updates, start the software application. If you have problems and you are using WinXP, you may need to log in as the administrator to run the software. If the program is a game, the problem may be related to an outdated driver for your video or sound card. Check the manufacturer's Web site and Windows Update for the current driver.

When using older software on WinXP, especially games, you may need to once again call upon the Compatibility Mode feature (refer to the Check out the Upgrade Centers section above to learn how to access this feature). Follow the wizard's on-screen instructions to select and test the appropriate Windows OS and compatibility settings for the problematic software.

Install new software. As with hardware, most software developed today is usually compatible with WinXP and is backward compatible with Win98/Me. Again, some software may not run on Win95, but most should work on Win98/Me/XP.

Despite this general rule, you should still do your homework if you are purchasing new software for your computer. Verify the system requirements to be certain the software will work on your current system setup.

■ **Homework Pays Off.** Unlike the homework you did as a child, researching compatibility does pay off in terms of time and money. Of course, you could just buy a new system with everything preloaded, but most of us can't afford to do that every time we want to upgrade the OS, install hardware, or add software. The next time you are faced with making a change, be sure to do your compatibility homework. LS

by Carmen Carmack

Recover Lost Data

Applications & Tips To Protect Your Files & Information

Today's computing technology is very reliable. Computer companies love to market gaudy statistics advertising infinitesimal failure rates for hardware components, such as processors, memory chips, and hard drives. Most hard drive manufacturers, for example, advertise MTBF (mean time between failure) rates in the hundreds of thousands of hours. If you believe the advertised failure rates, the chances of your hard drive suddenly failing due to mechanical component failure are minimal. These low failure rates are truly amazing, given the mechanical complexity and dizzying operating speeds of today's hard drives.

These favorable odds, however, are little comfort when a component fails and your precious data suddenly vanishes. A modem, memory chip, or video card is easily replaced at a nominal cost, but the loss of family digital pictures, that first novel, or last year's financial records can be costly and emotionally taxing. Ever since the days of room-sized behemoths running on vacuum tubes and miles of cabling, computers have served one common purpose: to store and retrieve data. Now that computers are such an integral part of modern life, data has become a valuable asset that is not easily replaced. No wonder sudden data loss is such a traumatic event.

To make matters worse, mechanical component failure is only one of the possible roads to disaster. Electrical power surges, natural disasters, viruses, unreliable software, and user carelessness are also frequent root causes of data loss mishaps.

Fortunately, there are as many ways to recover lost data as there are ways to lose it. In the next few pages, we show you some of the ways Windows is designed to help you recover lost data. We also show you some third-party applications that specialize in data recovery and help you retrieve lost data in those instances when Windows by itself won't do.

■ **Windows Data Recovery.** In the old days of DOS and Windows 3.1, file recovery options were limited to the old DOS Undelete command. This command-line tool let you recover an undeleted file, but only if no new files were written and/or changes were made to the storage medium, such as a hard drive, immediately following the deletion. To use Undelete, you had to immediately realize your error and begin recovery efforts. In terms of accidental file deletion, the margin for error was razor thin. But all that soon changed.

Recycle it. Beginning with Windows 95, Microsoft introduced the now-common Recycle Bin. The Recycle Bin's purpose is simple: Give users an easy way to recover deleted files. Files are not permanently deleted when the Recycle Bin is functioning, but they are stored in a temporary location where a user can easily retrieve them if needed.

Think of the Recycle Bin as the computer's purgatory, a place where a file resides until it is ultimately deleted into oblivion. Before the advent of Win95 and the Recycle Bin, the only way to recover a deleted file from Windows 3.x was to run the DOS Undelete command. This command could only be run from an MS-DOS shell and customization required knowledge of the various available command line **switches**, or options. A switch, also known as a command line switch, is an extra option added to a command to customize its behavior. In DOS syntax, command line switches are preceded with a slash (/). For example, if you type **undelete /all** in the DOS command line, undelete lists all files available for recovery.

The bin is actually a folder, called Recycled, located in the root directory of every partition in your system. Thus, the Recycle Bin stores files deleted from the C:drive in the folder C:\Recycled. This is the case for Windows 98/ Me/XP.

Windows does a couple of things when it stores a file you delete. Before moving the file to the Recycled folder, Windows renames it according to the format D<*original drive letter of file*><*number*>.<*extension*>. For example, a text file that is the third file deleted from drive C: is renamed Dc3.txt. Windows records path information for each file stored in the Recycled folder in a hidden file called Info2; this lets a file be restored to its original location if necessary.

Right-click the Recycle Bin icon on your Desktop and click Properties to configure it. In the Recycle Bin Properties dialog box, you can choose to configure each drive in your system independently, or you can simply use one Recycle Bin setting for all drive. Click the appropriate radio button to select one of these options. By default, the Use One Setting For All Drives option is selected.

To turn off the Recycle Bin, click the Do Not Move Files To The Recycle Bin checkbox; this tells Windows to delete files immediately. Of course, choosing this option completely

disables your ability to recover deleted files, so unless hard drive space is at an absolute premium, it is best to leave this alone.

The Recycle Bin reserves an amount of space (which you determine) in your hard drive for storing deleted files. Once the Recycle Bin fills up to its capacity, Windows begins deleting the older files to make room for newer ones. Use the Maximum Size Of Recycle Bin slider in the Recycle Bin Properties dialog box to determine the maximum capacity of the Recycle Bin. This amount is expressed as a percentage of your drive's capacity. By default, Windows chooses a maximum Recycle Bin size of 10% of a drive's capacity. So, if you have a 50GB drive, the Recycle Bin reserves 5GB for deleted file storage. Depending on how often you delete files and how large these files are, this Recycle Bin storage amount may last quite a while.

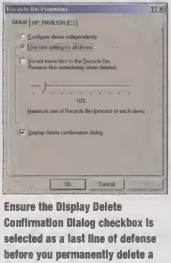
To review the files stored in the Recycle Bin, double-click the icon on your Desktop. This launches the Recycle Bin window, which includes a list of files you can sort by Name, Original location, Date deleted, Type, and Size. To recover a file, right-click the file name and click Restore; the file is now restored to its original location at the time of deletion. If you wish to permanently delete all files stored in the Recycle Bin, right-click the Recycle Bin icon and click Empty Recycle Bin; all files are now permanently deleted.

On a final note, operating the Recycle Bin is very similar across all recent Windows versions, from Win98 to WinXP. As with other features in WinXP, the Recycle Bin icon does look prettier than in previous versions.

AutoRecovery options. If you use popular Microsoft Office programs, such as Word and Excel, there are some easy ways to protect yourself against data loss. If you are using Office XP, you can configure Word to automatically save a backup copy of a file you are working on every time you save the file itself. For example, if you are working on a file you have called Budget.doc in Word and the backup option is enabled, Word automatically saves a backup copy of this file called Backup Of Budget.doc to the same directory where the original file is stored. To turn on this option in Word, click Tools, Options, and click the Save tab. Select the Always Create Backup Copy checkbox.

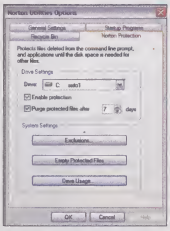
Another useful feature in Office XP is the AutoRecover option in Word. AutoRecover periodically saves information about the file you are working on so if a power outage, software crash, or some other mishap causes Word to stop suddenly, the next time you launch the application it automatically presents you with a recovered file. Word launches a Document Recovery window on the left side of the screen showing a list of recovered files. Double-click the appropriate entry to recover the correct file, or right-click and click Save to save it.

Temp file treasures. During the course of normal operations, Windows applications use temporary files to work with data. Typically, when an application or Windows itself is shut down properly, one of the final tasks the software performs is the cleaning out of these temporary files. However, when a sudden crash causes Windows or an application to terminate abnormally, these files are not deleted. If you encounter one of these situations and don't have any other options available to you (maybe your Recycle Bin is turned off), it is a good idea to explore these temporary files in case the application you were working with created a copy of the file.


Recycle Bin Properties
Global
HP_PAVILION (C:)
Configure drives independently
Use one setting for all drives:
Do not move files to the Recycle Bin. Remove files immediately when deleted
10%
Maximum size of Recycle Bin (percent of each drive):
Display delete confirmation dialog
OK
Cancel

Ensure the Display Delete Confirmation Dialog checkbox is selected as a last line of defense before you permanently delete a file from the Recycle Bin.

In Win98 and WinMe, temporary files are stored in the Temp folder at C:\Windows\Temp. Because WinXP is a multiuser OS (operating system), the location of the temporary file folder is C:\Documents and Settings*username*\Local Settings\Temp (your username replaces *username* in our example). If an unexpected system crash causes an accidental deletion, browse to the Temp folder and look for files with a .TMP extension and a tilde (~) preceding the file name. It is likely you will get nothing but garbage here, but you might get lucky and find most of a deleted file's contents. Make sure you do this as soon as you reboot the system to maximize your chances of finding useful data.



Click the Drive Usage button in the Norton Protection tab of the Norton Utilities Options dialog box to set the amount of hard drive space you want to allocate for deleted file storage.

■ Third-Party Data recovery Apps. As you can see, the data recovery options in Windows beyond the Recycle Bin are fairly sparse. If you are truly concerned about data loss and want more flexibility and features, it is best to look for a third-party data recovery application. There are a number of third-party applications available that specialize in data recovery. We'll look at two of these applications, Symantec's Norton UnErase Wizard ($49.95 for Norton Utilities 2002; http://www.symantec.com) and Executive Software's Undelete ($29.95 for the Home Edition; http://www.executivesoftware.com).

Follow the wizard. Norton Utilities' UnErase Wizard is just one part of Symantec's Norton Utilities Suite 2002, and it works in tandem with the Suite's Norton Protection feature. Much like the Recycle Bin, Norton Protection lets you allocate a percentage of your hard drive's space to temporarily store deleted files. When you install Norton Utilities, the Norton Protection feature is turned on by default.

To access the UnErase Wizard, right-click the Norton Recycle Bin icon (Norton Utilities renames the Recycle Bin to Norton Recycle Bin; however, you can change the name back to Recycle Bin if you wish) and select UnErase Wizard. When the wizard launches, you must choose one of two options: You can search for all Norton Protected files or search for specific files that match your criteria. Choose the appropriate option depending on the type of search you want to execute. Also, if you are using Windows NT, Windows 2000, or WinXP, click the Find All Norton Protected Users Files checkbox to search for other users' protected files. When finished, click the Next button.

If you chose to specify search criteria, type the name of the file you are seeking in the text box

within the next window. If you don't remember the file's entire name, use wildcards (? or *). Click Next to continue; the wizard launches a window with an Explorer tree view of your system to let you choose the location of the file. If you don't recall the file's location, click Next to advance. The wizard begins the search in the next window, and when it finishes the search, it populates the Deleted Files window with the results. This window shows the file name and the original location of the file. To restore the file to its original location, click the Recover button. If you chose to search for all the files, clicking Next launches the wizard's search results window and displays all the Norton Protected files. You can then scroll through the list until you find the file you want to undelete. Click the file to select it and click Recover to restore it.

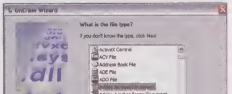
To customize how Norton UnErase and Norton Protection behave, right-click the Recycle Bin icon and click Properties. In the Recycle Bin dialog box, click the Recycle Bin tab to customize the Recycle Bin icon's behavior when double-clicked. You have three choices here: launch the UnErase Wizard, search for and display all protected files, or display the standard Recycle Bin. Also, you can change the name of the icon, just type the name of your choice in the Title text box.

To customize the Norton Protection settings, click the Norton Protection tab in the Recycle Bin Properties dialog box. Click the down arrow in the Drive field to choose the particular drive for which you want to customize Norton Protection settings. To enable Norton Protection for a particular drive, choose the drive in the Drive field and select the Enable Protection checkbox. To set the time, in days, that deleted files "live," click the Purge Protected Files After checkbox and type in the number of days or use the arrows to set the number. Norton Protection's default settings purge deleted files permanently after seven days. The Systems Settings option group includes three buttons: Exclusions, Empty Protected Files, and Drive Usage. The Exclusions button lets you choose file types you want to exclude from protection. For example, Norton's default settings include files with a *.TMP file extension in this list. Click the Empty Protected Files button to purge protected files manually and click the Drive Usage button to set the percentage of the hard drive you want to allocate for deleted file storage.

We found Norton's data recovery features worked pretty well at locating and recovering deleted files. Once customization options are set, Norton Protection works in the background, requiring little or no interference. Norton Utilities 2002 runs on Win98/NT/2000/XP.

Undelete it. Executive Software's Undelete is another example of a data recovery utility. The software comes in two versions, Undelete Workstation and Undelete Server. For this article, we looked at Undelete Workstation.

Like Norton Utilities, Undelete reconfigures the Windows Recycle Bin with new features and renames it "Recovery Bin." To configure the



Norton Utilities' UnErase Wizard lets you choose multiple criteria for locating deleted files, including file type.

Recovery Bin, right-click the icon and click Properties. The Recovery Bin Properties dialog box consists of a Global tab, a Common Bin tab, and a tab for each drive in your system.

The Global tab lets you decide whether to configure the Recovery Bin for all drives or configure the Recovery Bin for each individual drive. You can also decide whether each drive gets a Recovery Bin location or if you should create one common Recovery Bin location for all drives. The Global tab also lets you customize the Bin's behavior when it reaches full capacity, and it lets you enable the virus protection and SecureDelete features. Undelete's SecureDelete uses a Department of Defense-approved technique for permanently overwriting the location in the hard drive of a deleted file. The virus protection feature prevents a virus from making any files located in the Recovery Bin zero-length files, which is a common sign of a virus attack.

If you choose the Common Bin option, click the Common Bin tab and use the slider to set the amount of storage you want to use for deleted files. Otherwise, click the tab for each individual drive in your system and use the slider to set the amount of storage for each. The Common Bin and individual drive tabs also display the path to the Recovery Bin (always located at the root directory of the drive) and a box to enter the number of days files are stored before they are permanently purged.

To access Undelete's main interface, double-click the Recovery Bin icon. The program features two panes: the left pane shows an Explorer-like tree view of the drives where files have been deleted. Clicking the plus sign (+) next to the drive icons expands the tree and displays the various folders where recently deleted files resided. Once you find a folder where files were deleted, the pane on the right displays a list of deleted files, showing file name, size, date deleted, date created, the username of the person who deleted the file, and the username of the person who has rights to it. To restore the file, right-click the file name and select Recover from the pop-up menu. Undelete launches the Alternate Recovery Location window, which lets you choose the file's original location or an alternate location for restoring it.

Undelete also lets you search for deleted files in your hard drive, even those deleted before the program is installed. Click File and click Undelete Files From Disk to launch the Deleted Files window. Type the name of the file you want to search for (if any) in the Name field; use wildcard characters if you are uncertain of the file name. Type the location you want to search in the Look In field, or click the Browse button to specify it. When finished, click the Find Deleted Files button and Undelete searches the hard drive and displays the search results in the results window below. To recover a file, click the Undelete File(s) button, and specify the path you want to restore the file to by typing it or using the Browse button to specify it.

We are impressed with Undelete's speed; the program searched the drives in our test system and retrieved results very quickly. Also, the software had no problems recovering any type of file we threw at it. Unfortunately, Undelete only works in WinNT/2000/XP.

■ **Protect Your Data.** Even though data loss is serious, it's not impossible to recover from it. Your first line of defense against sudden data loss is to back up your files frequently. (See "Lessen The Possibility Of Data Loss" on page 119 for more on backing up your files.) You can reinstall your programs and OSes, but data is gone forever unless it is backed up to storage media such as CDs. If you seek more features and control for data recovery, check out the many third-party apps that specialize in data protection and recovery. As they say, an ounce of prevention is worth a pound of cure, so be sure to take steps to protect your data. LS

by Sixto Ortiz Jr.

Lessen The Possibility Of Data Loss

Back Up Your System & Keep Your Data Safe

Just like every other Monday morning, you head downstairs to your computer to input your weekly checking account entries. You power the computer up, but all you see is a blue screen. Sweat begins to roll down your face as you frantically try to get some response, any response. As you come to the realization that your hard drive crashed, you quickly become aware of the fact that all of your files went with it, everything. The seven years of bank statements, investment portfolios, budgets, contacts, and all the other important data you stored on your system is gone.

■ **Better Safe Than Sorry.** Don't wait for the worst to happen. Be proactive and back up the data on your computer. You've probably spent hours entering data into spreadsheets, inputting information into email messages, and creating documents. Many of us have so much data on our computers that it would take weeks, or possibly months, to replace it all. What's worse is some of the data is irreplaceable, which is why it is so important to have a backup available.

A number of things can occur that cause you to lose data on your computer. For example, a power outage, operator error, a virus, or a software or hardware installation can cause data loss. In most cases, you can recover your files in a few simple steps, but not all the time. In extreme cases of data loss, a user will have to reinstall a program or the OS (operating system). This type of reinstallation is often necessary when hardware, such as the hard drive, fails, but other things may be to blame, as well. Regardless of how data loss comes about, you need to be ready for it when it happens.

■ **Create A Schedule.** How often should you back up your data? Some people perform backups daily, some do it monthly, and others back up their data bimonthly or even semiannually. The number of backups you need to perform depends on the amount of data you enter on a daily basis. Let's discuss the different types of backups and how often you should perform each one.

There are three types of backups: full, differential, and incremental. A **full backup** ensures all files and programs on your system, including the operating system. **Differential backups** guarantee all files that were modified since the last full backup, and **incremental backups** back up all files that were modified since the last backup. For example, if you use a combination of full and differential backups, you will have one full and one differential backup to restore because a differential backup makes copies of only those files that were modified since you last performed a full backup. If you use a combination of full and incremental backups, you will have one full and several incremental backups to restore because incremental backups only save data modified since the last backup, not the last *full* backup. You can use any combination of

backups, but full and differential backups are the most common.

How you should use backups depends on what you are using your computer for. Home users that surf the Web, play games, or balance their checkbooks can probably get away with a full system backup once or twice a year. Any time data changes enough to make an important difference in a file, whether it is biweekly, monthly, or bimonthly, a user should consider performing a differential or incremental backup. For example, you may decide to perform a differential or incremental backup after you've spent hours entering new transactions into a check registry in a financial application.

Home-office and small-office users perform full backups four or six times a year on average, and differential or incremental backups weekly or daily. Differential or incremental backups are critical in a small office because the data inputted changes daily.

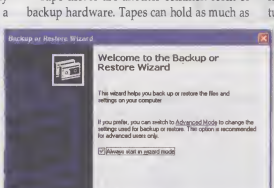
Individuals in larger offices usually perform full backups at least six times a year and differential or incremental backups more than once a week. Large offices typically have network administrators that perform backups according to a backup calendar set at the beginning of each year.

The important thing to remember is that you need a way to re-create any program installed on your computer. If you do not have a CD or floppy diskette to re-create a program, a backup is in order. For example, programs you download from the Internet, such as application upgrades or updated hardware drivers, don't come with backups. If the upgrade or program is important to you, creating a backup is the best way to safeguard it.

■ **What's Involved?** Now that you have an idea of when you need to perform backups, let's talk about what hardware and software you need to get the job done.

Hardware. Optical media, such as CD-RW (CD-rewriteable) drives and DVD+RW (DVD plus rewriteable) drives, are popular forms of backup hardware for home users. CD-RWs usually store about 650MB of data and cost about $10 for a five pack, DVD+RWs store about 4.7GB of data and cost about $40 for a five pack. From these figures, it is obvious that DVD+RWs are the better deal in the long run. But, if you do not have a DVD+RW drive on your system, stick with the CD-RW. The DVD+RW drives can be expensive and the CD-RW drive will work fine to create a backup file.

Tape drives are another common form of backup hardware. Tapes can hold as much as 40GB, making unattended backups possible. Eliminating the need for someone to be present to replace CD-RWs or DVD+RWs is a big advantage. This reason alone makes tape drives the backup hardware of choice for most businesses. The disadvantage to tape drives is that a good setup will cost considerably more than using optical media, and tape drives are slower than CD-RW and DVD+RW drives.


Backup or Restore Wizard
Welcome to the Backup or Restore Wizard
This wizard helps you back up or restore the files and settings on your computer.
If you prefer, you can switch to Advanced Mode to change the settings used for backup or restore. This option is recommended for advanced users only.
Always start in wizard mode
To continue, click Next.
< Back
Next >
Cancel

You can use the Backup Wizard in Windows XP to create a backup for your system if you don't want to spend the money on third-party software.

In addition to optical and magnetic (tape) media, alternate hard drives, storage providers on the Internet, and network connections are alternatives for storing backups. The important thing to remember is not to use your current hard drive because if it fails, you have no way of accessing the backup. Storing a backup on your only hard drive is like keeping a spare set of keys to your car in the glove box. What happens when you lock yourself out?

Software. We recommend using a third-party software program to create your backup, although Microsoft offers backup programs in its OSes, as well. The advantage to using third-party software, such as NTI Backup Now ($79.99; http://www.ntiback upnow.com) or Veritas Backup MyPC ($79; http://www.veritas.com), is that they offer more backup options and create their own emergency bootable diskettes (also known as boot disks), which are important.

Boot disks come in handy after a complete system failure. Some backups run from your OS, so to restore your files, you have to install the OS and then run your backup. If your hard drive does not boot, you have another problem. Inserting the floppy into the drive before turning the power on prompts the system to boot from the floppy instead of the hard drive, letting you start the system and then install the OS.

■ **Backup Wizard.** The boot disk will get your system started, and your backup will restore all your files. To create a backup using Windows Backup Wizard in Windows 98 or Windows 98 SE, click Start, select Programs, Accessories, System Tools, and click Backup to open the Backup Wizard dialog box. If Backup isn't in the System Tools menu, you will need to install it. To install Backup, click Start, select Settings, and click Control Panel. Click Add/Remove Programs and choose the Windows Setup tab. Click System Tools to highlight it and click Details. Select Backup and click OK.

From the Backup Wizard dialog box, select Create A New Backup Job and click OK. Select Back Up My Computer to back up everything on your system or Back Up Selected Files, Folders, And Drives to back up only the files you have specified. If you chose Back Up My Computer, click Next and select All Selected Files for a full backup or New And Changed Files for a differential backup, and click Next. If you chose Back Up Selected Files, Folders, And Drives, click Next, select the files you want to back up, and click Next. Both paths are now at a point where you can select where to store the backup. After choosing where to store the backup, click Next. The Backup Wizard presents you with two choices, of which you can select any combination. The choices are Compare Original And Backup Files To Verify Data Was Successfully Backed Up and Compress The Backup Data To Save Space. We recommend you select both options and click Next. Enter a name for the backup when prompted and click Start.

The Backup Wizard in WinMe and Windows XP is installed from the installation CD. Insert the installation CD into the drive; in WinMe, click Browse This CD, and double-click the Add-Ons folder. Double-click the MSBackup folder and the Msbexp file. After installation, Windows will prompt you to

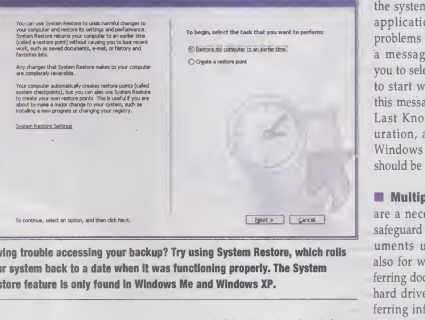
restart your system. In WinXP, close the initial screen that appears and click Start and My Computer. Right-click the drive that contains the installation CD and click Open. Double-click the Valueadd folder, the Msft folder, and the NTbackup folder. Next, double-click NTbackup again and click Finish when prompted.

The steps for using WinMe's Backup Wizard are identical to those for Win98 SE. WinXP users will need to click Start, select All Programs, Accessories, System Tools, and click Backup to open the Backup Or Restore Wizard dialog box. Click Next and Windows asks "What Do You Want To Do?" Select Back Up Files And Settings and click Next. In the next dialog box, where Windows asks "What Do You Want To Back Up?," click the All Information On This Computer radio button for a full backup. Click Next. Then, choose a location to save your backup. If the location you want is not listed in the field, click Browse to find the location you want. Type a name for the backup in the next field and click Next. Windows will present you with a summary of backup specifications. If everything is correct, click Finish to begin the backup; otherwise, click Back to make corrections.

■ **Other Options.** An alternative to the Backup Wizard for backing up games, documents, and images is Windows Explorer. To find Windows Explorer, in Win98 SE click Start, select Programs, and click Windows Explorer. In WinMe, click Start, select Programs, Accessories, and click Windows Explorer. In WinXP, click Start, select All Programs, Accessories, and click Windows Explorer. Two options are available for backing up your files in Windows Explorer. One is to highlight the files you want to back up (to select multiple files hold the CTRL key down as you click the left mouse button), right-click your selections, and click Send To in the pop-up menu. Select the location you want the backup to save to and Windows will start processing a backup. The second option is to open My Computer and double-click the drive where you want to store your backup. Leave this window open and open Windows Explorer in a separate window. In Windows Explorer, select the files you want to back up, right-click, and click Copy. Now, right-click an open spot in your drive window and click Paste. Windows will transfer copies of the files to the media in the drive you selected.

The quickest way to back up documents is to save them to a floppy or optical disc once you are finished with them. This ensures the documents will be safe no matter what happens to your system.

■ **Bonuses.** Backups are nice to have, but if your system refuses to boot altogether, a backup won't do you any good. WinXP and WinMe users have a feature called System Restore that lets them roll the system back to a date when everything was working properly. System Restore is accessible from an active Windows Desktop or from Windows' Safe Mode. Windows periodically sets restore points when a major change is made to the system, such as when a new program is installed. To access a restore point click Start, select Settings in WinMe (or All Programs in WinXP), then select Accessories, System Tools, and click System Restore to open the System Restore dialog box. Select Restore My Computer To An Earlier Time and click Next. Select the date you want to restore to on the calendar (dates with restore points are bolded) and click Next. Make sure all programs and files are closed and click Next. Note that you will need to reinstall any applications you installed after the restore point.


System Restore
Welcome to System Restore
You can use System Restore to undo harmful changes to your computer and restore its settings and performance. System Restore returns your computer to an earlier time (called a restore point) without causing you to lose recent work, such as saved documents, e-mail, or history and favorites lists.
Any changes that System Restore makes to your computer are completely reversible.
Your computer automatically creates restore points (called system checkpoints), but you can also use System Restore to create your own restore points. This is useful if you are about to make a major change to your system, such as installing a new program or changing your registry.
System Restore Settings
To begin, select the task that you want to perform:
Restore my computer to an earlier time
Create a restore point
To continue, select an option, and then click Next.
Next >
Cancel

Having trouble accessing your backup? Try using System Restore, which rolls your system back to a date when it was functioning properly. The System Restore feature is only found in Windows Me and Windows XP.

You can also create your own restore points by selecting Create A Restore Point from the System Restore dialog box. Enter a name for the restore point in the Restore Point Description field when prompted and click Create. A confirmation showing the date, time, and name of the restore point will appear on the screen.

WinXP has one more advantage over older OSes when it comes to restoring lost data, the Last Known Good Configuration boot option. This option comes in handy when an installation of an application or driver interferes with booting Windows. When you start the system and the driver or application that is causing problems begins to interfere, a message appears asking you to select the OS you want to start with. When you see this message, press F8, select Last Known Good Configuration, and press ENTER. Windows will boot and you should be fine.

■ **Multiple Uses.** Backups are a necessity, not only to safeguard against losing documents unexpectedly, but also for when you are transferring documents onto a new hard drive or system. Transferring information from the hard drive is easy as long as your new OS permits it. If you have more than one OS, make sure you label your backups accordingly because you don't want to restore a Win98 backup on a WinMe system.

■ **Be Smart.** We rely on computers every day for so many things that most of us forget they are merely machines, and unfortunately, all machines eventually break down. Back up the data on your computer and keep your confidence high in the middle of the next big electrical storm or tiny power glitch. Don't learn the hard way. Create a backup for your files and guarantee their longevity; you will be happy you did. LS

by Mary Lafferty

When Floppy Diskette Drives Go Bad

Determine Whether To Update Or Replace Your Drive

One of the most common peripherals found in PCs is the FDD (floppy diskette drive, also known as a floppy drive). The FDD reads and writes relatively small amounts of data from removable magnetic media called floppy diskettes (commonly referred to as floppies).

Although the use of the FDD has decreased in recent years, it is still a necessary component in most PCs, and because they are mechanical devices, FDDs are subject to wear and damage. In this article, we describe how to repair and, when necessary, replace a standard FDD.

■ **A Little History.** IBM introduced the first FDDs in the early 1970s as read-only devices. They were used to load microcode and diagnostics software into mainframe computers from 8-inch, single-sided floppies that had a capacity of less than 100KB. The media was a thin, flexible, circular disk coated with magnetic material that was enclosed in a paper-like sleeve for protection. The floppy was so flexible that it could easily be folded in half. This construction is what led to the name flexible diskette or floppy. An elliptical hole in the sleeve provided access to the data but it also exposed the magnetic surface to potential physical damage.

As technology improved, these original floppy drives evolved into read/write devices, and in 1976, Shugart Associates introduced a 5.25-inch version that became the standard used in PCs for several years. The media for these drives was similar in construction to the 8-inch floppies and suffered the same dangers of physical damage. The highest-capacity 5.25-inch floppies held approximately 1.2MB of data.

In 1980, Sony introduced the forerunner of the 3.5-inch FDD that we still use today. You can purchase a modern drive for less than $25, and it uses a floppy with a formatted capacity of 1.44MB. The media itself is still a thin circular disk, but it is enclosed in a rigid plastic case for better physical protection. To further protect the media, a retractable plastic or metal shutter (which only opens when the floppy is inserted into the drive) covers the access hole.

■ **The Changing Role Of The FDD.** In the days prior to the PC, hard drives were very rare and cost thousands of dollars. Desktop computer systems of the day, such as North Star's 4MHz Z80-based Horizon, were equipped with two 360KB FDDs, designated A: and B:. In a typical configuration, drive A: contained the OS and system utilities and drive B: contained the application software and its data. If additional online storage was necessary, users could add a second pair of FDDs. During this period, floppy drives were everything: the boot device, the mass storage device, and the backup device.

As internal hard drives became more affordable, the FDD's changed. It was no longer the primary data storage device, but it was still the most common way to install new software, including OSes (operating systems), and the floppy was frequently used to transport data from one computer to another. Floppies were also used to make emergency repair disks (rescue floppies) a user could use to restart his computer if the hard drive failed to boot.

Today, most computer applications are so large that floppy distribution is impractical. Instead, software is typically distributed on a CD-ROM, capable of holding the equivalent of more than 400 3.5-inch floppies. With the introduction of the bootable CD, FDDs are no longer required to load or upgrade an OS, and Windows XP is so large that it no longer supports floppy-based emergency boot diskettes. The remaining tasks for the once critical floppy drive are the storage and sharing of small files. Even this role will disappear once all computers are equipped with CD-RW (CD-rewriteable) drives, but until then, you will need to retain and maintain your PC's FDD.

■ **Some Common Problems.** As mentioned earlier, FDDs are largely mechanical devices with a number of delicate moving parts. Magnetic read/write heads are mounted on an arm that moves the heads across the surface of the media housed inside the plastic case when data is transferred. These heads must properly retract from the surface before the floppy is removed to avoid being damaged. If the heads get damaged, you'll likely have to replace the drive.

Most FDDs contain a sensor that tells the floppy drive controller when the heads are positioned over their home position at track 0. If this sensor is misaligned, the heads will be positioned incorrectly, resulting in read and write errors when the computer

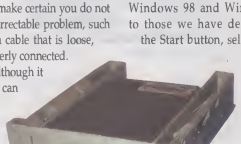
accesses the floppy. Although it is possible to realign a FDD, the procedure requires special equipment or special diagnostic software, and it is usually cheaper to replace a FDD than repair it.

One exception to the replace-rather-than-repair rule, however, is when a floppy's shutter prevents you from removing the floppy from the drive. As mentioned earlier, the shutter is a thin piece of plastic or metal that slides open to expose the media when the floppy is inserted into the drive. If the floppy is not held parallel to the plane of the drive during removal, the edge of the shutter can catch on the inside of the drive. If you exert too much force when removing the floppy, the metal shutter can bend, making complete removal impossible even when the floppy is properly aligned with the drive. If this should happen, make every effort to extract the floppy manually from the drive before deciding to replace the drive.

To manually remove a floppy, use a thin instrument, such as the blade of a pocketknife, to gently hold the edge of the shutter away from the top (or bottom) of the opening and gently remove the diskette. If there is not any portion of the floppy exposed, try using a small pair of needle-nose pliers to grasp the edge of the plastic case. Remember to pull gently to avoid additional damage to the floppy and/or the drive. If the floppy still won't budge, remove the FDD from your computer and take it to a qualified PC technician.

■ **Look Before You Leap.** Before you remove and replace your FDD, make certain you do not have a simple, easily correctable problem, such as a corrupt driver or a cable that is loose, disconnected, or improperly connected.

Software issues. Although it is rare, software drivers can become corrupt and cause your FDD to malfunction. If you suspect this may be the case, you might want to update the driver before taking your computer apart. Be sure to have your OS installation CD handy so you can load a fresh copy of the driver.



The 3.5-inch floppy drive shown here is mounted in an adapter that lets you install it in a 5.25-inch drive bay. Most modern PC cases include separate 3.5-inch bays.

To update the FDD drive in WinXP, click Start, select Control Panel, and click Printers And Other Hardware. In the upper-left portion of the Printers And Other Hardware window, locate the See Also heading and click System. In the System Properties dialog box, click the Hardware tab. Click the Device Manager button in the middle of the dialog box to display a list of devices.

The floppy diskette system actually spans two categories in the list: Floppy Disk Controllers and Floppy Disk Drives. Each component has its own driver. You should use the driver update procedure described below for best results.

Update FDD drivers. To update the drivers, click the plus sign (+) next to the Floppy Disk Controllers category to expose the specific devices. Right-click Standard Floppy Disk Controller and click Properties. In the Standard Floppy Disk Controller Properties dialog box, click the Driver tab, and click the Update Driver button to start the Hardware Update Wizard. Follow the instructions the wizard provides to complete the driver update procedure and then repeat the process on the Floppy Disk Drive category. You are performing this update because you suspect corrupted drivers on your hard drive, so be sure you instruct the wizard to use the driver from the original Windows Setup CD and *not* from your hard drive.

If the updated driver does not work correctly, you can click the Roll Back Driver button in the Standard Floppy Disk Controller Properties dialog box. The Roll Back Driver feature lets you replace the updated device driver with the previously installed version.

The procedure for updating drivers in Windows 98 and Windows Me is similar to those we have described above. Click the Start button, select Settings, and click Control Panel. Double-click the System icon and click the Device Manager tab. Expand the appropriate categories by clicking the plus sign, right-click the device, and click Properties. Click the Driver tab in the dialog box that appears for the device you selected and then click the Update Driver button to start the wizard.

As mentioned earlier, corrupt drivers are probably the least likely cause of a malfunctioning floppy diskette drive, but because this procedure doesn't require opening the case, it may be a good place to start.

Hardware issues. An FDD has two cables connected to its backside, and if either one is loose, your drive will not operate properly. The smaller cable provides power to the drive and is usually located on the right side. The connector itself may be a small, flat, 4-pin connector or a larger 4-pin connector. Both types of connectors

This is a standard floppy drive data cable with various connectors. The lone connector at the bottom connects to the controller, which may be integrated onto the motherboard. The pairs of connectors, from left, are for drives A: and B:, respectively.

are keyed to prevent them from being installed upside down, so don't force the connection if it doesn't come together properly right away.

The second cable is the data cable. It is a 1.75-inch wide ribbon cable with as many as five connectors on it. Typically, one end of the cable has a single connector with 34 holes, arranged in two rows of 17. This end connects to the FDD controller, which is either on the motherboard or separate controller card that plugs into the motherboard.

The other end of the ribbon cable connects to the FDD and may have one to four connectors, with the most common configuration being four. The two connectors closest to the end of the cable are for the FDD designated as drive A: and the other two are for the FDD designated as drive B:, if present. Between the pairs of connectors, you should find a twisted portion of cable.

There are two connectors for each drive letter because older FDDs used a larger, flat connector with a slot through the center, and newer drives use a 34-pin connector similar to the one that attaches to the controller. Use whichever connector fits your FDD.

The FDD data cable, like the other ribbon cables inside your PC, is a common source of trouble. The connectors on these cables do not have any type of latch or locking device to secure the connector to the socket, and the size and shape of the cables can cause the

connectors to partially separate as a result of normal vibrations in the case.

Human error is another common cause of loose cables in a PC. Sometimes you have to disconnect the wide ribbon cables to gain access to other components in your PC, and it is easy to forget to reconnect the cables. You can also disconnect a ribbon cable accidentally while moving it out of the way. Make it a habit to physically check every ribbon cable connection before you secure the case of your PC.

When you reconnect ribbon cables, be sure you don't insert the connector backwards. The connectors may not have a key or notch to ensure proper orientation, but the cables have a colored stripe along one side, representing the location of Pin 1. Before reconnecting a ribbon cable you must examine the device or plug it is attaching to and locate Pin 1. You have the cable properly positioned when the stripe on the cable corresponds with Pin 1 on the plug. If you connect the FDD cable backward at either end, you will normally receive a "Floppy Disk Fail (40)" error when you restart the PC.

Before you replace a suspect FDD, disconnect the cables, check for bent or broken pins and then reattach the cables, paying special attention to cable and pin alignment mentioned above. It is possible to connect some ribbon cable connectors in a way that a row of pins on one end or the other is left exposed, so use a flashlight to verify that the connector is properly seated.

Here you can see that the floppy drive was removed from the bay adapter. The metal rails bolt to each side of the adapter and latch into the case, making removal of the adapter easier.

■ **FDD Replacement.** If you determine your FDD really has failed, there's nothing to do but replace it. The task isn't as complicated as you might think, but it does require a few simple tools and the removal of your PC's case. If you are uncomfortable doing this on your own, take your PC to a professional. Don't risk an expensive repair for the sake of a $25 FDD.

Before you begin the replacement procedure, remove any floppies from the drive, turn the computer off, and disconnect the power cord from the electrical outlet. Except for the power supply itself, the voltage inside your PC doesn't exceed 12 volts DC, but if the power is accidentally turned on while you are connecting a cable, it could damage the FDD, the controller interface, or even the motherboard.

Relatively small amounts of static electricity can damage many of the components in your PC, so you should select a work location that is free of synthetic materials, such as carpet, if possible. You can also purchase an antistatic wristband, like the ones professional technicians wear, from local and online computer retailers, including RadioShack (http://www.radioshack.com) or Tech Depot (http://www.techdepot.com). If you don't have access to a wristband, touch a bare metal area on the case or frame of your PC before touching any electronic components inside.

Remove your computer's case and locate the FDD. Carefully examine the drive, paying particular attention to how it is mounted before you start removing screws. The drive may be bolted directly to a portion of the case or it may use a set of rails that latch the drive into a mounting bay. To further complicate things, the 3.5-inch FDD may be mounted horizontally or vertically in a 3.5-inch or a 5.25-inch bay.

Carefully disconnect the two cables described above from the back of the drive, remove the drive from the PC, and detach any remaining mounting brackets. If the drive is installed in a 5.25-inch bay, you will also have to remove it from a bay adapter.

Examine the replacement drive and note the type of power cable connector required. If you are replacing an older unit, you may discover the old drive's power cable doesn't have the same connector as the new drive. If this is the case, find an unused connector that has the correct connector and make sure it is the right length. If you cannot find the correct connector, visit your local computer retailer and look for an adapter to convert the old-style power cable to the newer connector.

Also note where Pin 1 is located on the new drive's data plug. This information is often etched into the circuit board near the plug and it should also be included in the documentation that came with the drive.

Attach all of the mounting hardware to the new drive exactly as it was installed on the old drive. Not all machine screws are the same size, so be careful not to damage a threaded hole by forcing the wrong screw into it.

Once you have completed the mechanical assembly, slide the FDD back into the case. Before securing the drive or bay adapter to the case, connect the cables to the back of the drive. The area behind the drive can be an awkward place to work, and having the drive loose makes attaching the cables easier. Once the cables are attached, slide the unit into place and install the remaining screws. Be careful not to pinch the cables or pull them loose during this process.

Before you put the case back together, it's a good idea to check the other cables inside, especially the other ribbon cables, to make sure you haven't accidentally pulled something loose. Secure the case, reconnect the power cord, and turn your PC on. During the boot process, watch the monitor for error messages, particularly the Floppy Drive Fail message described earlier. Test your new drive by writing and then reading data using a new floppy, if possible.

Next, verify that the new drive can read a floppy created with the old drive. If an alignment difference prevents you from reading your old floppies, it's better to know about it now. Because the misaligned drive is probably the old one, you must either attempt to have it fixed so you can copy your data to new floppies or recreate the floppies from other sources, such as backup tapes.

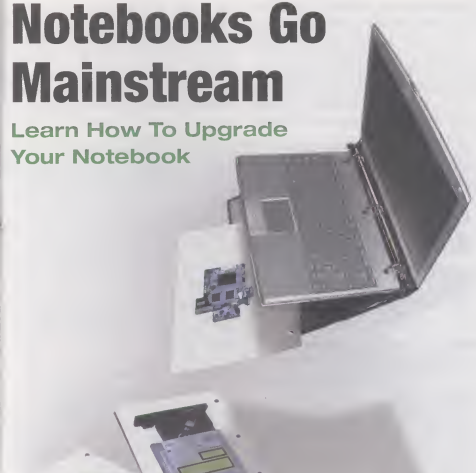
The rear view of a standard 3.5-inch floppy drive, showing the two connectors. Pin 1 of the data connector is marked on the underside of the unit.

■ **The Beginning Of The End.** Many PC users still depend on floppies to back up important documents because they are quick and easy to use. If you routinely store correspondence, past year's tax files, or any other important data on floppy diskettes, your PC's FDD is a valuable asset. Using the information above, you should be able to repair or replace your system's floppy drive if it ever becomes necessary to do so. LS

by Dick Archer

Notebooks Go Mainstream

Learn How To Upgrade Your Notebook



Purchasers of desktop computers have a wide variety of options available to them, both at the time of purchase and in the form of upgrades and add-ons. What options do people who own notebook computers have? You may be surprised to learn that many of today's notebooks provide upgrade options that rival their cousins in the desktop world.

■ **Looking Back.** In the early days of notebooks, users were willing to sacrifice expandability in favor of portability. If your computer use required mobility, you selected the notebook that best met your needs (or your budget), used it for as long as you could, and replaced it with a new notebook.

As recently as four years ago, notebook computers offered very little in the way of configuration options, and they had even fewer choices once the machine left the factory. Additional RAM and larger hard drives were usually available, but due to the lack of standardization in the notebook industry, you were required to purchase these items from the original manufacturer at premium prices.

Internal devices, such as video interfaces, modems and even the CPU were integrated into the notebook's motherboard in the interest of saving space. Many discrete components, such as keyboards, floppy diskette drives and CD-ROM drives, were usually custom-engineered to fit into unique case styles.

The only practical way to increase the capabilities of these older units is to attach external devices to the existing I/O (input/output) ports. These include serial, parallel, and PS/2 ports, as well as the popular PC Card slots.

PC Cards, often called PCMCIA (Personal Computer Memory Card International Association) cards (after the organization that controls the standards), are small, credit-card-sized interface cards that are inserted into the PC as add-ins rather than attached to an external port as add-ons. One end of the card connects to the notebook's motherboard through a socket recessed into the side or back of the PC. The card operates much like a PCI (Peripheral Component Interconnect) card in a desktop PC and provides some of the same services: Ethernet, SCSI (Small Computer System Interface), and modem connectivity.

■ **Outside The Box.** A number of current notebook PCs offer all the connectivity of the older machines along with some new technologies, such as CardBus (an improved version of the PC Card interface), IR (infrared), FireWire, and USB (Universal Serial Bus). These ports are also available on most desktop PCs, and they expand the number and type of external devices you can connect to your notebook to include high-speed digital camcorders, tape backup systems, external hard drives, and a wide variety of other peripherals.

If your notebook came with a CD-ROM drive and you need to burn your own discs, you can add an external Iomega Predator ($149.95; http://www.iomega.com) CD-RW (CD-rewriteable) drive with a USB 2.0 interface or Que! Fire ($180; http://www.qps-inc.com) external CD-RW drive with a FireWire interface.

Most newer notebook computers include an integrated Ethernet card, but if yours doesn't, you can connect an external Linksys (http://www.linksys.com) USB100 10/100Mbps (megabits per second) NIC (network interface card) to your one of your USB ports for less than $25.

You can even increase the mass storage capacity of your notebook by adding the Que! M3 external 80GB hard drive for less than $160. This drive comes in USB 2.0 or FireWire versions and is an excellent place to store your library of MP3 files, collection of digital pictures, or other large projects.

■ **Inside The Box.** Although the peripherals we mention above may expand the usefulness of your notebook, they don't address its basic characteristics, such as CPU speed or video quality. They also don't provide a solution for broken or worn-out components such as modems or keyboards. In the past, high prices and the lack of available or spare parts made many older notebooks a risky buy.

To learn how component manufacturers are addressing the standardization problem, we contacted computer manufacturer CTL

(Computer Technology Link; http://www.ctlinfo) in Portland, Ore. We also examined the components of our own Hewlett-Packard Pavilion n6395 notebook computer.

CTL manufactures a broad range of computer systems, including servers, desktops, and notebooks. According to Jason Edwards, CTL's notebook product specialist, the components used in current notebook PCs are more standardized than most consumers realize. To illustrate his point, Edwards invited us to CTL's corporate offices, where he dismantled a working CTL Travel Master notebook and let us examine the discrete components.

Many of the internal components in notebooks, such as the Travel Master and the Pavilion, are standard, readily available items that qualified technicians can easily replace. For example, the hard drive in the dismantled Travel Master unit is the same Fujitsu 20GB, 9.5mm (millimeter) device, and the Pavilion includes an IBM TravelStar 30GB drive. The plastic caddy the drives mount into are unique for each style of case, but the drives themselves are readily available on the Internet and from many wholesalers.

The same is true of most optical devices, such as CD-ROMs, CD-ROM/DVDs, and CD-RW/DVD combo drives. The basic mechanisms of these optical drives are a standard configuration and can often be interchanged. CTL notebooks and our HP model use Matsushita optical drives. Upgrading your notebook's internal CD-ROM drive to a device that can play DVDs and burn CDs may not be as difficult or expensive as you think.

In the early days of notebooks, motherboards were custom-designed to fit into each new model's unique case. This constant reengineering is part of the reason why notebook PC prices remained much higher than comparably equipped desktops. Nowadays, many notebook manufacturers, including CTL, use mass-produced motherboards from Intel (http://www.intel.com). These high-quality boards are sold in volume, reducing the unit price dramatically.

The CPU in the Travel Master demo unit we looked at was an Intel Pentium III-M operating at 1.0GHz, but newer notebook models support Pentium 4-M CPUs at speeds of 1.7GHz to 2.4GHz. The CPUs are inserted into a standard Mobile socket, just as they are inserted in desktop computers. Within certain ranges, upgrading the speed of one of these notebooks is a simple matter of popping out the old CPU and replacing it with a faster version. This is a major improvement over older machines where the CPU was soldered onto the motherboard.

One component of the Travel Master notebook that we were surprised to see was the removable video card. The Travel Master's card was equipped with an NVIDIA GeForce4 420 Go GPU (graphics processing unit) and 32MB of onboard DDR (double-data-rate) memory. Feeling the need for speed? Simply remove the existing card and install one with a GeForce4 440 Go GPU and 64MB of memory. Again, the use of these standardized, readily available cards is a relatively new advancement in notebook PC technology. Older units used onboard video circuitry that couldn't be upgraded or replaced.

PHOTO COURTESY OF COMPUTER TECHNOLOGY LINK

This is the CTL Travel Master notebook computer prior to disassembly by a factory technician.

The modem in the Travel Master is also replaceable. Because modem technology hasn't changed much in the past several years, it is not necessary to upgrade the standard 56K V.90 data/fax modem, but if the unit should fail, it's good to know that you can replace it.

The Travel Master notebook we examined included an integrated 802.11b wireless LAN (local-area network) card that makes use of an antenna built into the lid of the case. Again, this card is easily removable because it plugs into a standard mini-PCI connector on the motherboard. This design means users can upgrade from the included 11Mbps (megabits per second) card to the faster 802.11a (54Mbps) card when it becomes available.

Even the LCD (liquid-crystal display) is replaceable. XGA (extended graphics array; 1,024 x 768 pixels), SXGA (Super XGA; 1,280 x 1,024 pixels), and UXGA (Ultra XGA; 1,600 x 1,200 pixels) units are available from several manufacturers.

■ **Uniquely Yours.** Some items in computers are so unique that they cannot be standardized. The battery, for example, is usually a molded plastic module that conforms to the shape of the case. We learned that some of the newer lithium-ion batteries are being manufactured with replaceable cells; that way, authorized service centers can refurbish the battery module and computer owners don't have to completely replace it. Also, notebook batteries are one item that has developed a competitive third-party market. See Notebook-Batteries.net (http://www.notebook-batteries.net) or NICA Power Battery (http://www.nica.ca) for companies that sell after-market batteries designed to fit specific makes and models of notebook PCs.

Another unique component in the Travel Master is the cooling device. It is designed to fit snugly around the other components, and it is custom-engineered for the case. This device ships with the case, and replacements are available from the notebook manufacturer or the manufacturer of the case. The fan itself is a standard electronics component that you can replace without discarding the entire cooling unit.

■ **Don't Try This At Home.** The CTL technician disassembled the Travel Master demo notebook to the state shown in the picture on page 127 in less than 15 minutes, but he suggests that you not try this at home. The plastic cases and the delicate components they protect are easily damaged and require special knowledge to manipulate. Notebooks have come a long way in terms of available upgrades, but you still need the services a skilled technician to perform most of these tasks.

■ **Moving Up To Windows XP.** The move by notebook manufacturers to produce more standardized components is improving the hardware upgrade options for today's notebook PC buyer, but what about upgrading the OS (operating system)? If your notebook came from the factory with Windows Me installed, can you (and should you) upgrade to Windows XP?

Unfortunately, the answer to this question depends a lot on your particular notebook and the type of support available from the vendor. Manufacturers of interchangeable components, such as the video cards described above, have an incentive to keep their drivers updated and to develop additional drivers as new versions of Windows are released. Unique, onboard systems, such as sound cards, are less likely to remain current, especially if the motherboard is discontinued. In general, the more onboard circuitry your notebook has, the more difficult it will be to upgrade to a newer version of Windows.

For example, our HP Pavilion, which was released in March 2001, shipped with WinMe already installed. A search on HP's Web site (http://www.hp.com) for "n6395" yields 20 articles. One article, "HP Omnibook And Pavilion Notebook PCs—Microsoft Windows XP Support Statement," addresses some of the WinXP upgrade issues n6395 owners will face.

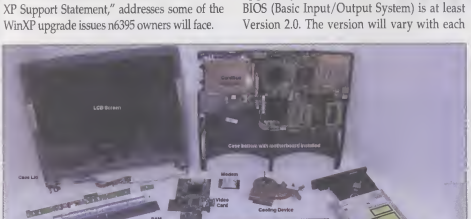


PHOTO COURTESY OF COMPUTER TECHNOLOGY LAB

In less than 15 minutes, a CTL technician turned a working notebook PC into this collection of parts and components. This kind of disassembly is something you should leave to a technician.

HP provides the necessary information and drivers for the Pavilion model we looked at. Of the 20 notebook series listed in the article, HP doesn't recommend attempting an upgrade on 10 of them and another four are listed as having only limited upgrade support. For our Pavilion model, HP provides links to two additional documents: An article on how to perform a clean install of WinXP and an article on how to upgrade from WinMe.

The upgrade article begins by warning you that you need 2.5GB of available hard drive space and that "once you upgrade to WinXP, you cannot go back to your previous OS unless you use the HP Recovery CD that came with the computer. Using this CD will erase all data on the hard disk drive." So, before you begin the upgrade, you should back up the notebook in case the upgrade is unsuccessful. This may not be a trivial task if your system is full because the Pavilion n6395 contains a 30GB hard drive. An external USB tape drive, such as OnStream's external ECHO30 model (http://www.onstream.com), is a good backup solution for large-capacity notebooks. It stores 30GB (compressed) on a single tape cartridge and sells for about $350.

In the upgrade article mentioned above, HP advises that before beginning the WinXP upgrade, you must make sure your system's BIOS (Basic Input/Output System) is at least Version 2.0. The version will vary with each computer manufacturer, but you should make sure your BIOS is current before proceeding.

One way to check the version number of your BIOS is to use WinMe's Help and Support utility. Click Start, select Programs, Accessories, and System Tools, then click System Information and view the BIOS information in the right panel.

Before continuing with the upgrade, HP instructs you to uninstall 18 built-in applications. These include items such as Adaptec's EasyCD and DirectCD software, McAfee VirusScan and Softex's BayManager application. Some of these products must be replaced with newer, WinXP-compatible versions, while new features built into WinXP replace other products, such as the BayManager hot-swap application. The HP article also states that all necessary replacement software is available at no charge from HP's support.

The exact number and type of outdated applications will vary from notebook manufacturer to notebook manufacturer, but this uninstall process will probably be necessary for any system you upgrade to WinXP. After the OS upgrade is complete, you'll need to reinstall updated, compatible versions of these applications and certain device drivers. It is important that you acquire these items *before* you start the upgrade or you could find yourself with a computer that doesn't work and no way to connect to the Internet to get the correct software.

Download and burn the required software components onto a CD or store them on one or more floppies so they are accounted for and available before you begin the upgrade.

■ **Better Safe Than Sorry.** If the prospect of upgrading your notebook makes you nervous, you might consider a different approach. If you can afford the cost of a second hard drive, you can perform a fresh WinXP install on the new drive while your data, applications, and OS remain safe on the original (removed) drive. If everything goes well, you can move your data over to the new drive after you have reinstalled your applications or their WinXP counterparts. If your installation fails, you can quickly reinstall your original drive and be operational in a matter of minutes.

This approach is more time-consuming because it requires you to reinstall every application, even ones that don't have WinXP-compatibility issues, but if your notebook is an integral part of your workday, you may not want to risk being without it. If the WinXP install is successful, you can store the original WinMe hard drive away and use it for a fresh install of whatever OS replaces WinXP.

What we've learned from our tour of CTL's offices and HP's Web site is that today's notebooks have more upgrade options available than systems sold a few years ago. The industry-wide move to standardized, removable components will protect your notebook investment by extending the life of the basic unit while providing you the option to upgrade specific components as new technologies become available.

It also appears that some, if not all, notebook manufacturers are genuinely interested in providing the proprietary drivers and other software necessary to keep their PCs current. This type of commitment is necessary if notebook PCs are ever to replace desktop models as the standard workstation design. One can envision a time in the future when the desktop computers of today, with their huge CRT (cathode-ray tube) monitors, will look as antiquated as the 7-foot tall minicomputers of the 1970s and 1980s. LS

by Dick Archer

Install A New Power Supply

What To Do If Your System Loses Power

The computer power supply is perhaps one of the most under-appreciated components of the PC. We take for granted that when we press the power button on our PC, electricity will flow into the machine and it will boot up (turn on and prepare for operation). We never stop to consider that without a power supply, which converts standard electric household current into a form the PC can use, a modern computer would be inoperable.

When a power supply fails, it can prevent the PC from starting or, even worse, can provide enough power only for limited operation, which can result in data corruption or hardware failure. For this reason, it is critical that your PC have a top-quality, properly operating power supply. In this article, we will discuss the functions of the power supply and the causes and symptoms of its failure. We will then walk you through choosing and installing a new power supply.

■ **Foreign Current-cy.** Like many electronic devices, computers run on DC (direct current) rather than on the AC (alternating current) that comes from an electrical outlet. The electrons in DC current run continuously in one direction, while the electrons in AC current switch directions back and forth. This switching process makes AC power more susceptible to power surges and spikes, which is why DC is the preferred current for electronic devices, including computers. One of the chief jobs of the power supply is to perform this conversion from AC to DC in the same way that the external power supply for a telephone or video camera does.

The power supply is also responsible for regulating the amount of power going into the various components of the PC, some of which require more juice than others. Most power supplies can produce power in 3.3, 5, and 12 volts. The motors in hard drives and CD drives run on 12V (volt) power, although most digital circuitry (such as switches that power the CPU or wiring in a serial or parallel port) runs on 5V or 3.3V. Contrast this with the 120V power coming into a power supply and the importance of this element becomes quite apparent.

In addition to supplying the right power to the appropriate components, power supplies perform a number of protective operations, such as monitoring the amount of power going to a component and shutting down or resetting the flow of electricity if the voltage deviates too far from the norm. As we'll discuss, some power supplies perform these tasks much better than others.

■ **Abuse Of Power.** A number of factors can cause a power supply to fail, including age, frequent power surges, and component overload. Another cause for failure is inferior parts and workmanship. The basic technology behind a power supply is simple, and a number of companies produce very inexpensive, no-frill power supplies. These basic units, which are often used in budget-priced PCs, often use substandard transformers and capacitors and have an alarming rate of failure. According to computer research firm Strategic Research Corporation, power supplies account for less than 2% of the cost of most PCs, yet they account for 28% of their problems.

When a cheap power supply begins to fail, it can quickly become a bad bargain. When pushed to their limits, inexpensive power supplies tend to wear out much more quickly than their more pricey counterparts. In addition, they are often unable to deal effectively with problems from power surges and other electrical problems. Bad conditions can ruin even a good power supply. Common culprits are homes with frequent power surges and spikes, computers crammed with too many or inferior components, and AC circuits overloaded with high-demand items such as electric heaters or air conditioners.

A deteriorating power supply will generally alert you, either with a loud whine or growl at startup (symptom of a failing fan) or inexplicable memory errors, random reboots, data corruption, or hardware failure. There may also be a burning smell when you shut down your computer. These alerts aren't much of a warning, however, because they mean that damage is probably already being done to your system. If you suspect the power supply is failing (or if you cannot turn the computer on at all), you should replace it immediately.

Do not attempt to open the power supply and inspect it. Power supplies are dangerous electrical components. If you tamper with the power supply, it may catch fire or cause

electrical problems when you attempt to restart the computer. In addition, opening your power supply may void the warranty on your computer.

■ **More Power To You.** Even if your power supply seems fine, consider upgrading it, especially if you have an expensive computer or can't afford unscheduled downtime. You can purchase a good power supply for less than $100, which is less than a new computer will cost if your power supply fails and takes other components with it. Situations in which a top-notch power supply is of particular advantage are:

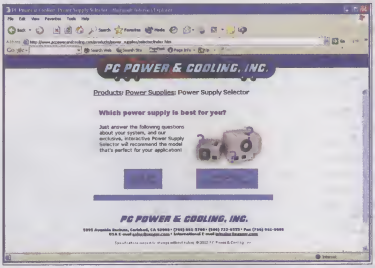
- Computer upgrades—If you plan to soup up your system with high-end video cards, extra hard drives, or other add-ons, you should upgrade the power supply, as well.
- Power problems—If you live in an area that experiences frequent power fluctuations, surges, or outages, make sure your power supply is equipped with features to help protect your computer.
- UPS (uninterruptible power supply) usage—Better power supplies have longer **hold times** than their less expensive counterparts. This is the time during which a power supply will continue producing output after a power failure. Your power supply's hold time should be considerably longer than the switch time of your UPS.
- 24/7 operation—If you use your computer as a Web server or in any situation where it must be available around the clock, you should upgrade your power supply, possibly to a redundant component that has two units. This provides a back-up power supply in case the first one fails.

■ **The Source Of All Power.** When it comes to choosing a power supply, a little research will help you make the right choice. You can also check the Web site of the company that manufactured your processor (such as AMD [http://www.amd.com/us-en] or Intel [http://www.intel.com]) or the Web sites of some leading power supply companies for their recommendations. One well-respected company with a very wide selection is PC Power & Cooling (http://www.pcpowerandcooling.com).

Here are some specific features (in order of importance) to look for in a power supply.

Wattage. Wattage measures the total capacity of the unit. For the average user, 275W (watts) should be sufficient, but 300W is best.

Form factor. Power supplies, cases, and motherboards are identified by their form factor, which identifies their shape and other physical characteristics.


PC POWER & COOLING, INC.
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Which power supply is best for you?
Just answer the following questions about your system, and our exclusive, interactive Power Supply Selector will recommend the model that's perfect for your application!
PC POWER & COOLING, INC.

PC Power & Cooling is one Web site you can visit if you are looking for a power supply. The site offers a selector applet that helps you choose the correct power supply.

Pentium I and older PCs (and a few Pentium IIs) use the AT (Advanced Technology) form factor, which was named after the PC/AT computer in which it was originally used. Most newer PCs use either the ATX (Advanced Technology Extended) form factor or microATX form factor, whose matching power supply is the SFX (Small Form Extended). The ATX is an improved, more efficient version of the AT form factor, while the microATX is a smaller version of the ATX. A fourth form factor, WFX, is uncommon in PCs and is used mainly in servers.

The form factor of your power supply must match that of your case and motherboard. Check the documentation that came with your PC if you are unsure of your current form factor. Unless your PC was built before 1997, you probably have either an ATX or SFX power supply. ATX and SFX power supplies are almost universally interchangeable, but ATX power supplies are slightly larger and offer the best combination of power and cooling capability, so we recommend that users of both ATX and SFX power supplies opt for an ATX power supply during their upgrade.

Hold time. As discussed earlier, if you have a UPS, hold time should exceed switch time. Long hold time is also valuable in situations where blackouts of momentary duration (such as grid switching by the electric company) occur periodically. The minimum hold time of a good power supply is 20ms (milliseconds).

Load regulation. The ability of the power supply to keep voltage levels constant as power demands increase or decrease up to a predetermined level. A 5% variance is common; 1% is excellent.

Line regulation. The ability of the power supply to regulate its power output as power input levels fluctuate. A variance of 1% to 2% is common.

Overvoltage or overcurrent protection. A feature within the power supply that enables it to reset or shut down if the voltage of any output (or all outputs) exceeds a predetermined value. The level of protection is generally expressed in percentages above 100%; 125% is a common value.

Noise level. How loud the power supply and fan are. This is important in quiet environments. Look for power supplies that are designated "low noise" or that have "silencer" features.

MTBF/MTTF (mean time between failures/mean time to failure). How long a power supply is expected, on average, to perform without trouble. A rating of 30,000 hours is the minimum; 50,000 or higher is better.

Certifications. Third-party entities should always test power supplies. In the United States, power supplies should be UL (Underwriters Laboratories)-certified. In Canada, they should be CSA (Canadian Standards Association) International-certified. The most environmentally friendly power supplies will also be Energy Star-certified.

■ **A Powerful Improvement.** If your computer is a Pentium II or later, you should be able to replace your power supply with a minimum of fuss. Users with older PCs, however, may find it easier to have the power supplies professionally replaced or (even better) upgrade their motherboards (See "How

To Replace Your Motherboard" on page 131). We make this recommendation because Pentium I and older PCs (and some Pentium IIs) used a design in which the power (on/off) switch was wired directly to the power supply. Intel changed this design in 1995 when it released the ATX specification, which moved the connection for the power switch to the motherboard. When you replace the power supply on an older PC, you will have to disconnect and then reconnect the wires to the power switch. Because drive bays often block access to the power switch, it can be difficult to locate, making power supply replacement a headache.

For users with newer computers who wish to replace their power supplies, we have only one caveat. The task is simple if you follow directions. However, remember you are working with electricity, and do not take any shortcuts.

To begin your power supply upgrade, turn off the computer and all its peripherals (modem, printer, and so on) and unplug the power cord. Note the point at which the cord unplugs; this is the back of your power supply. Unplug all the cables that run to the back of the computer, noting their positions.

Move the computer to a well-lit surface. Remove the small screws that surround the back of the computer and remove the PC case. If your PC is a tower (taller than wide), tip the chassis on its side with the most open side up.

Before you proceed, touch something metal (such as your PC's case or any metal object) to discharge any built-up static electricity. Next, locate the large metal box that contains the power input you identified earlier. This is your power supply.

There will be a number of wires running from the power supply to various places within the computer. These are the electrical cords that power your motherboard and other internal components. Make a note of which wires go where for easy reference later. One small plug is for your floppy diskette drive. The medium-sized plugs are for your CD-ROM or DVD drives, your hard drive, and possibly your CPU fan (these are interchangeable). Depending on your PC, there may be additional connections, as well. One set of wires runs to a large plug on your motherboard. You must be very careful when removing this set of wires, so save it for last.

Reach to the end of each set of the wires and gently pull the white plastic plug that connects the wires to the component. Do not pull on the wires themselves. Wiggle the plug back and forth until it comes away from the component. This may be difficult to do because some of these plugs have probably not moved since the PC was manufactured.

If you are replacing the power supply on an older computer, you will also have to disconnect the group of wires running to the power switch. These connect individually, and there may also be a ground wire. Make a note of where the various wires connect because you will need to place them in the same positions later.

Only after you have removed all the plugs other than the motherboard connection can you examine the motherboard plug. Older computers will have two plugs, while newer ones will have only one long plug. There should be a clip that secures the plug in place. If so, push the clip out as you are pulling, or you may damage your motherboard.

Power supplies are simple metal boxes with fan exhaust areas on one side and a large bundle of cables on the other. This is a power supply from high-performance company Sky Hawk USA (http://www.skyhawkusa.com).

A redundant power supply has two separate supplies stacked one on top of the other. Shown is a redundant power supply from Sky Hawk USA.

You're now ready to remove the power supply. Look at the back of your computer and locate the power supply. There are four screws that hold the power supply in place. Remove these screws, holding the power supply as you remove the last screw so the power supply doesn't slip within the computer. Lift the power supply out.

Look for a switch adjacent to the power plug on the back of your new power supply. It should be red or black. This determines the voltage going into the power supply. In the United States, the setting will be 115V.

Place the new power supply into position in the case with the back resting snugly against the back wall of your computer. The cutout in the back of your computer is shaped so the power supply fits in only one position. Hold the power supply in place while you replace the screws removed earlier.

Compare the connectors on your new supply with those on your old one to see which ones go where. Insert the new plugs into their appropriate positions. They can only connect one way, so flip them around if necessary to get the right side up. On your motherboard, look for the notch that matches the clip on the plug to orient it properly.

If you have an older computer that uses the AT form factor, your power supply will have two motherboard plugs. It is possible to connect them backward. It is important to note that doing this can short out your motherboard, so it is extremely important that you place them correctly. Orient them so the black wires in the two separate plugs are next to each other. If you are replacing the power supply on an older computer, you will also have to replace the wires running to the power switch.

Once everything is connected, you are ready to go. Bundle up any extra wire and tuck it neatly into the chassis, using a twist-tie to hold it all together. Reattach the PC case and reconnect your peripherals and power cord. Plug the computer in and turn it on.

■ **The Power Is Yours.** Now that you know just how important a power supply is, you're probably ready to evaluate the one you have in your PC. Check your PC's documentation or the manufacturer's Web site to determine whether your current power supply meets your needs. If it doesn't, back up your system and plan for an afternoon of downtime. Unlike a CPU or memory upgrade, a power supply upgrade won't provide an immediate and apparent performance boost. It will, however, provide you with peace of mind and give you confidence that the electricity powering your PC is being managed in the most efficient way possible. LS

by Jennifer Farwell

How To Replace Your Motherboard

Solutions For When Your Mainboard Gives You Troubles

You've just tried to install a new CPU and discovered that it is a different size from the one currently in your computer. Perhaps you've purchased a flashy new video card only to find that your computer does not have an AGP (Accelerated Graphics Port). Or, when you recently turned on your PC, you were greeted with a barrage of short, unfamiliar beeps and the scent of ozone (often described as the smell of lightning during a storm). Now, your computer won't boot up at all.

If any of these scenarios describes your situation, you may need a new motherboard (the large plastic circuit board in your computer that is the foundation of your system). Unfortunately, replacing a motherboard is no simple task. In fact, it is probably the most complicated hardware operation you will ever perform on your PC. Consequently, you'll want to make sure it's the right decision before you proceed. In this article, we'll discuss the reasons you may or may not want to replace your motherboard. For those users who decide a new motherboard is the right way to go, we will also help them choose and install a replacement model with as little hassle as possible.

■ **Mother, May I?** The motherboard, which is also referred to as a mainboard, logic board, or system board, does more than form the physical foundation on which the components of your PC rest. It is also the central connection point for all the hardware in your computer, ranging from the CPU and memory to the video card, CD-ROM player, and other devices. Every component and bit of circuitry required to enable your PC to function is either integrated in or attached to the motherboard.

The motherboard also acts like the central nervous system of your PC, tying the disparate elements together. Any information or requests that flow from one component of the PC to another must go through the motherboard. Finally, the motherboard conducts electricity around to the various components of the PC.

Motherboards have undergone many improvements in the nearly 30 years since the first PC became available. This is good news for PC users, but it can be bad news for the users who wish to upgrade. Because the components of a PC are so deeply integrated, they all must work together in harmony, and many components of older PCs are not compatible with newer motherboards. Virtually every component of a PC (CPU chip, memory, power supply, and other hardware) has undergone dramatic alterations (and improvements) over the past few years. Even PC cases have changed, which means a new motherboard may not fit an older case.

Now that you have the bad news, here's the good stuff. A new motherboard can make your older PC scream, especially when paired with a new CPU. It can let you replace obsolete components, such as outdated video cards, with radically faster, more efficient hardware. And *finally, a good motherboard can set you up for* future expansion, so you won't be forced to buy another computer next year when you realize you need even more speed and power.

■ **Tinker Toy.** Should you install a new motherboard? A lot depends on your "tinker factor" (how much you like playing with your PC's internal components and whether you want to devote the effort to the upgrade). Some computers are designed in such a way that disconnecting a handful of wires and cables and removing a few screws will free the motherboard from bondage.

With other designs, it is impossible to remove the motherboard without disassembling the PC. In this situation, it is often easier to lift out the old components and move them to a new case and motherboard rather than attempt to replace the old board. You may want to inspect your computer's design to evaluate it for an upgrade and possible case replacement before you proceed. See the When Mother Comes To Visit section for instructions on opening your computer for inspection.

Another consideration is how much other hardware you want to replace. The more comprehensive your upgrade, the more logical it becomes to include a new motherboard among your purchases.

If your PC is more than five years old, you can replace the motherboard with equipment from a surplus house, but the results won't be

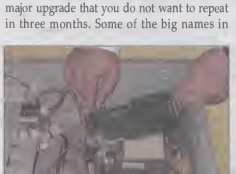
worth the effort. To upgrade the motherboard, you'll have to upgrade everything, including the CPU, memory, circuit cards, case and power supply. That's not a bad idea, but it will mean building a new computer. In situations like this, it may be less expensive to buy a ready-made or built-to-order computer. If you decide to rebuild your computer, you can use exactly the components you want and gain the satisfaction of knowing you did it yourself. Several articles in this issue can help you on your quest for a new PC. See "When Floppy Diskette Drives Go Bad" on page 122, "Install A New Power Supply" on page 128, "Pick Up The Pace" on page 134, and "Out Of Space?" on page 138.

If your PC was built after 1997, you can probably reuse the power supply, case, and some of the add-on PC cards (such as sound and video cards), replacing those components later on if you wish. You'll still likely want a new CPU and more memory; the prices on these are pretty low right now.

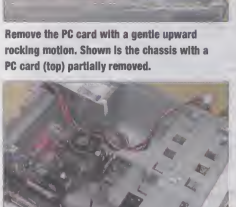
If your PC is only a year or so old and your motherboard has failed, you can probably trade up to a new motherboard and keep most of your other hardware intact. Users who have newer, bargain-basement PCs are also candidates for upgrades. Inexpensive motherboards sometimes have integrated sound and video chips that you cannot disable, which means you cannot install the newest generation of multimedia or gaming cards. If this problem has occurred with your system, a new motherboard may be the answer.

■ **Shopping For Mother.** Before you shop for a new motherboard, refer to the manual that came with your PC. Note the processor speed and type, memory type, and the number and type of expansion slots (which is where the PC cards attach to the board), and the connection type of your keyboard and mouse. You will also need your form factor; this designation identifies the size and other physical characteristics of your PC's motherboard, case, and power supply. Pentium I and earlier machines use the AT (Advanced Technology) form factor, while most Pentium II and all Pentium III and later machines use the ATX (Advanced Technology Extended) form factor or some variant of it. Don't worry if your current form factor doesn't match your new motherboard; a new case will solve the problem.

With information about your current configuration in hand, you can evaluate the various options available on motherboards and decide which other components you will also need to replace. The number one rule in motherboard selection is don't cut corners. Stick with well-known brands and spend as much as you need in order to get the right motherboard for your current and short-term needs. This is a major upgrade that you do not want to repeat in three months. Some of the big names in



Remove the PC card with a gentle upward rocking motion. Shown is the chassis with a PC card (top) partially removed.



Before you can replace the motherboard, you'll need to disconnect a number of wires and cables. You may find it helpful to place them over the sides of the case as shown.

motherboards are Abit (http://www.abit-usa.com), ASUS (http://www.asus.com), Epox (http://www.epox.com), Gigabyte Technology (http://www.gigabyte.com.tw/index.html), and Iwill (http://www.iwillusa.com).

Some of the features to look for in a motherboard include:

Built-ins. Some motherboards incorporate on-board sound and video. These chips free up your expansion slots, but they can limit expansion options as discussed earlier. If you buy a board with onboard multimedia, make sure you can disable it later if needed.

Cache. Caches are small, onboard memory chips that speed up system operation. Explaining caches can get pretty complicated. Just remember, the more you have and the more powerful they are, the better.

CPU. Most motherboards work with specific processors, but a handful will accommodate a range of processor speeds within the same CPU class, such as Pentium II or III. These are a good option if you want to use an existing CPU now and upgrade later. If you want to reuse your CPU, you'll have to match the socket (chip connector) type (some examples are Slot 1, Socket 370, and Slot A). If you plan to upgrade your CPU with the motherboard, a combo board, in which the CPU is already installed, is a good value.

Expansion slots/ports. When it comes to expansion ports, look for two PS/2 ports (one keyboard, one mouse), two or more USB (Universal Serial Bus) ports, two serial ports, and one parallel port. When looking at expansion slots, look for four or more PCI (Peripheral Component Interconnect) and one AGP (Accelerated Graphics Port) slots. AGP comes in four standards: 1X, 2X, 3X, and 4X (4X is the fastest). Nice options for future expansion are an AMR (Audio/Modem Riser) slot, which supports a special card or chip that handles the analog to digital conversion functions (for sound and modems), or a built-in wireless (Bluetooth or IEEE [Institute of Electrical and Electronic Engineers] 1394) bus. You should also have at least two (preferably four) slots for memory chips.

Overclocking. Some motherboards have switches that make it easier for users to overclock their CPU. Overclocking is the practice of increasing a CPU's speed beyond its rating. It does have risks, such as overheating the CPU, but it is still a very popular technique.

System bus. This is the data pathway between the motherboard and the processor. System buses on new, high-end boards offer speeds higher than 200MHz. Don't settle for anything less than 133MHz.

■ **When Mother Comes To Visit.** When you are ready to install your new motherboard, back up the important data on your PC (to a medium other than your hard drive) and locate a Phillips head screwdriver and needle nose pliers. Turn off your computer and all its peripherals (printer, scanner, and so on) and unplug the PC's power cord. Unplug all the cables that run to the back of the PC, making note of their positions. You

may want to use a variety of different-colored permanent markers or small colored labels to place color-coordinated dots on each cable and matching port.

Move the computer to a well-lit surface. Remove the small screws that surround the back of the computer and remove the PC case. To discharge any built up static electricity, touch something metal, such as your PC case, before you proceed.

The inside of your computer will be a maze of wires and, depending on its age, either cables or wide, flat plastic strips (called ribbon cables). These wires and cables connect the components in your PC to its power supply, motherboard, circuit boards, and ports. Look for the motherboard. It is the large, flat (probably green) piece of plastic against one wall of the PC.

Look at the outside of the computer on the side where the motherboard is installed. You should see screws that hold a removable plate in place. If so, you will be able to remove these screws and lower the plate to gain easy access to your motherboard. If there is no external access to the motherboard, consider purchasing a new case and transferring the components (including the motherboard) to it.

Orient your PC (carefully tipping it on its side if necessary) so the motherboard is at the bottom of the chassis. Remove any screws that secure the circuit cards affixed to the motherboard. Grab each card by its edges and remove it by gently rocking back and forth while pulling upward. Place each card so no circuitry touches anything else. Remove the screws that hold your ports (parallel, serial, and USB) in place. You will also be unplugging these from the motherboard, but it is easier to see the connections if they are not attached to the case.

Locate all the wires and cables running to your motherboard and remove them, one at a time. Make note of where each wire goes. Some may already be marked. There will be cables for your drives and ports, in addition to wires for a CPU fan, the lights and buttons on the front of your PC, and other electronic items. In each case, pull only on the plastic connectors that terminate the wires and cables. As you remove each connector, flip the wire and connector over the closest edge of your case to make the motherboard easier to see.

One set of wires will run from the power supply to the motherboard. These may be held in place by a clip that fits into a notch on the motherboard. If so, release the clip before you begin pulling on the connectors to facilitate removal. There may be one or more hard plugs that attach to the motherboard through holes in the case (these are for keyboards and other ports). Gently but firmly twist them out from the motherboard.

The motherboard should now be completely unattached to any component of your PC other than the memory chips and CPU. If your case offers external motherboard access, turn the PC back on its side and remove the screws that secure the access tray. Carefully lower the plate and examine the motherboard. There should be clips, pins, or screws (possibly in each corner of the motherboard) that hold it in place. Use needle nose pliers or a screwdriver to squeeze or remove these and release the motherboard. Remove it from the tray.

If your case does not have a removable tray and you do not want to buy a new case, you may need to remove the hard and/or floppy diskette drives to release the motherboard from the inside. See the articles, "When Floppy Diskette Drives Go Bad" on page 122 or "Out Of Space?" on page 138 for assistance.

After you release the clips that hold the memory chip (top center) in its slot, the memory will pop up out of the slot for easy removal.

If you plan to reuse your memory or CPU, remove them from the old motherboard. To remove the memory, look for long, thin plastic chips placed perpendicular to the board. With your thumb and finger, press down on the clips on either side of the memory chips that hold them in place to release the chips. As each chip pops loose, grab it by its edges and remove it. You should not have to rock the memory or force it to dislodge from the motherboard. Install the memory on the new motherboard, placing the first chip in Slot 1 (usually the one closest to the CPU) and locking it in place. Refer to the motherboard manual for special instructions. To remove and reinstall the CPU, See "Pick Up The Pace" on page 134.

Check the manual of the motherboard to see if there are jumpers to set. Many newer motherboards are jumperless, so don't be surprised if there is no such instruction. Review the motherboard's installation manual at this time for instructions. Install the new motherboard, replacing it in the tray or case and securing it with the appropriate pins, clips, or screws. Return the tray (if you have one) to its closed position. Replace the connection for each component—power supply, electric wiring, drive cables, ports, and then PC cards. Refer to your motherboard's manual to identify the various connectors and the manner in which they connect. Be very careful when connecting the electrical wires because you can easily short out the motherboard if you connect the wires improperly. Press firmly but gently on all connectors to ensure they are completely inserted.

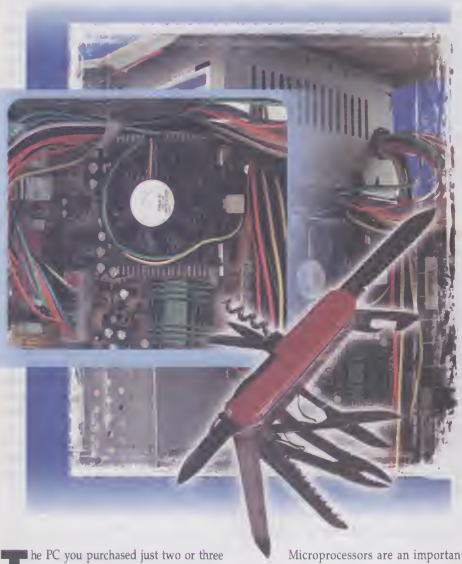
Once you've reconnected everything, reattach your power cord, monitor, keyboard, and mouse, and turn the PC on. The **BIOS (Basic Input/Output System;** the software that handles system startup) should auto-detect the components in your system. Watch the screen as the PC starts to see what messages display. If the system starts but ends with the C:\ prompt, reinstall Windows. If an error message is displayed, you'll need to configure the BIOS or check the connections. Refer to the motherboard manual for assistance.

■ **Mother Knows Best.** Now that you've installed your new motherboard, you can begin exploring its potential. Review its manual (yet again) to see what tweaks and tips it may offer. Then sit back and enjoy your new system. Not only have you greatly expanded your PC's capabilities, but you've also taken the first step toward becoming a competent hardware technician. LS

by Jennifer Farwell

Pick Up The Pace

Replace Your Old CPU With One That Meets Today's Standards



The PC you purchased just two or three years ago was everything you wanted at the time. But times are changing and your computer just isn't keeping up. The computer industry changes so rapidly that most people who purchase a computer eventually find themselves in this predicament. New games on the market don't run quite as fast as they should on your older system and programs take a long time to open. Installing a new CPU could solve these problems. The CPU is a delicate and a very important part of your system, but it is also one of the easiest components on the computer to install.

Microprocessors are an important part of many items we use today, including cell phones, pagers, airplanes, and automobiles. However, the most common microprocessor is the CPU. The CPU, among other components, controls how fast your computer can process data. Acting as the brain of a computer, a CPU receives, transfers, and processes all data that enters the computer.

■ **How The CPU Works.** The CPU is one of the most complicated components of a computer. It is hard to grasp the numerous functions that take place in a split second to process one keystroke. We will briefly explain how a CPU works and how to read the specifications of a CPU. It is important that you know exactly what certain specifications mean when shopping for a CPU to make sure you get the most for your money.

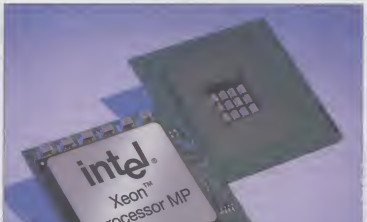
A CPU understands one language, known as **binary**. Binary is a math system based on only two numbers: 1 and 0. The CPU recognizes the 1 as true or yes and the 0 as false or no. When information is entered into a computer, it is sent to the CPU as electronic pulses. These electronic pulses are sent to a series of devices inside the CPU known as **transistors.** Transistors receive the electronic pulses and assign a numeric value to the information. The series of transistors is known as the **logic gate** and they are one of the most important components inside the CPU.

Next, the decoder unit assigns a binary equivalent to the numeric value, such as 0101011, which the processor can understand. For example, when you press the letter C on the keyboard, the information is sent as electronic pulses to the logic gate and translated as 67. The decoder unit translates 67 as 01000011, which is the binary language for the letter C. The decoder unit sends the information to the control unit, which stores the data in the cache memory. Once the data is in the cache memory, it appears on your screen through your system's bus.

Your system's bus transports data to and from any input device, the system's main memory, and the CPU. CPUs also have internal buses that transport data internally among units and address buses that connect the CPU to the main memory of the system. Buses are measured in bit width, which designates how many bits of data the bus can transport simultaneously. You can take advantage of a high bit width in your CPU even if your system's bus has a lower bit width. In fact, it is common to have a CPU bus twice the size of a system bus because a processor transports data at a higher speed. This speed differential is possible because of the cache.

Cache memory eliminates the need for the CPU to wait for data from the system. Cache is a temporary memory storage bank that acts much like RAM does to the PC. Cache memory stores instructions and data from the system, letting you take advantage of the high speed of the CPU. CPU speed is measured in clock speed or clock frequency.

Clock speed is probably the most common and well-known specification of a CPU. The clock speed designates the number of cycles a CPU can perform in one tick of the computer's internal clock, and it is measured in **MHz** (**megahertz**; or millions of cycles per second) or **GHz** (**gigahertz**; or billions of cycles per second). Clock speeds can be confusing; fortunately, only two major CPU manufacturers are in the market, and learning how each comes up with speed specifications should eliminate any confusion you may have.



Intel is one of the top manufacturing contenders in the CPU market. Included in its line of processor models is the Xeon. It is used mainly with network computers, which makes it popular among businesses.

■ **Intel Or AMD?** The two major contenders in the CPU market are Intel (http://www.intel.com) and AMD (http://www.amd.com). Intel holds the majority of the market, but since 1999, AMD has been taking its share. Each company focuses on different aspects of the CPU to increase performance. Knowing the difference between these two companies and how to read specifications is important. For example, an Intel 1.8GHz CPU will usually perform equal to an AMD 1.4GHz CPU. This is possible because of IPC (instructions per clock cycle).

IPC designates the number of functions the CPU can perform with each cycle of the system's clock. Each processor has a chip that holds processing engines (also called parallel execution units). The engines process information simultaneously, letting more information be processed per cycle. AMD's 1.4GHz Athlon chip holds nine processing engines where as Intel's 1.8GHz Pentium 4 only holds six, giving the Athlon processor a higher IPC. Because the P4 has more speed, it can process information in the same amount of time as the AMD. The higher the IPC, the lower the clock speed, and the higher the clock speed, the lower the IPC. The bottom line is, Intel is focusing more on clock speed, and AMD is focusing more on IPC.

So, which company should you look to purchase a CPU from? That all depends on your motherboard. Most motherboards are either Intel-compatible or AMD-compatible. You cannot use a newer Intel CPU on AMD-compatible board, and you cannot use a newer AMD CPU on an Intel-compatible board. In older models, Intel and AMD were interchangeable, but that has changed in recent years, as we discuss in more detail below in the "What You Need To Know" section.

■ **What You Need To Know.** If we could buy any CPU and plug it into our motherboard, upgrading would be simple. Unfortunately, it is a little harder than that. Packaging style and speed are two important factors to consider. Packaging style will determine which CPUs your motherboard will accept and speed will determine how much faster your CPU will process information.

When looking for a CPU, you will see seven common packaging styles that are not interchangeable or compatible with each other. Some CPUs attach to your motherboard horizontally through rows of pins and some attach vertically through flat metal contacts. Search your computer's users manual or your manufacturer's Web site to find out what packaging style your motherboard requires. If you cannot find the information in either of these places, you can remove your computer's cover and use the criteria below to determine what your motherboard requires.

In the beginning, AMD and Intel CPUs were interchangeable because they both used Socket 7. Socket 7 is a 321-pin socket found on older motherboards that accept Pentium, Pentium MMX, K6, and K6-2 processors. Then Intel came out with the Pentium II and Pentium III processors that require Slot 1 or Slot 2 connections. Slot 1 is a single edge 242-pin adapter that is compatible with Pentium II and Pentium III processors, and Slot 2 is a single edge 330-pin adapter that is compatible with Pentium II and Pentium III Xeon processors. Xeon processors are used primarily with network servers so if you have a Pentium II or Pentium III processor, chances are it is not a Xeon. In later-model Pentium III and Celeron processors, Intel used Socket 370 connections, a socket-style adapter with 370 pins. In the

CPU Language

When a command is given to the computer, such as pressing a letter on the keyboard, the command is sent to the CPU as electronic pulses. The pulses are sent to the transistors, which assign a numeric equivalent to the pulses and send them to the decoder. The decoder assigns a combination of 1s and 0s to the commands, translating them into a binary language the CPU can understand. At right is a small chart that shows some of the numeric and binary equivalents of different letters.

English	Numeric	Binary
C	67	01000011
O	79	01001111
M	77	01001101
P	80	01010000
U	85	01010101
T	84	01010100
E	69	01000101
R	82	01010010

A good way to prevent against static electricity is to buy an antistatic wristband from a computer store.

latest Intel CPU, the Pentium 4, Socket 423 adapters are used.

AMD used Slot A adapters in its earlier models, with the exception of the K6 and the K6-2. In later models such as the Athlon and Duron, AMD uses a 462-pin Socket A adapter.

In addition to packaging, make sure you get a CPU that operates at a speed your system can take advantage of. Know the capabilities of your system's bus before purchasing a CPU. The bus that connects and transfers data from the main system memory and your CPU is called the frontside bus. These buses are measured by how much data they can transfer at one time and how many cycles they go through per second. The 100MHz or 133MHz frontside buses are common in computers today. The CPU uses multipliers to multiply the speed of the frontside bus, so a 700MHz processor would need a 100MHz frontside bus speed and a multiplier of 7 to reach its full potential. Check the multiplier and frontside bus speed of your motherboard in your users manual to make sure it can handle the speed of the new CPU. If it can't, you might want to look into upgrading your motherboard.

■ **Tools Of The Trade.** Now that you know how to select a CPU, let's talk about the tools you need to have available before you start the upgrade. Your new CPU should come with a manual that walks you through installation; make sure to keep this close by. You also want to make sure you have a clean workspace, something to ground yourself with, and some of the tools that we mention below.

A clean workspace is important because you don't want to lose any screws or clips that may have come with your new CPU or that you pull off your old CPU. Make sure your work area is well lit and has enough room for you to move around. A cramped work area can make your job harder. Clean the work area with any household cleaner before you get started and wash your hands to avoid getting dirt in unwanted places.

Static electricity is fun to play with (such as those times you rubbed a balloon on your head to make your hair stand up or when you rubbed your shoes on carpet to shock the person next to you), but it is a death sentence for computer components. To avoid frying your components, take precautions against static electricity. Keep your clothes from touching the components and make sure to touch something metal before handling the CPU or any computer component.

By touching something metal, you ground yourself and prevent static electricity from using you as a carrier. A good way to prevent against static electricity is to buy an antistatic wristband from a computer store. One end of the band wraps around your wrist and the other end clips to something metal, such as the computer case. We strongly recommend using a wristband to safeguard against any serious damage. A wristband that costs between $5 and $10 is a lot cheaper than buying a new hard drive or processor. Some parts of the CPU come wrapped in antistatic wrappers and have antistatic pads included in the box, so use whatever comes with the component to safeguard against static electricity.

In addition to a clean work area and a safeguard against static electricity, have your system manuals ready in case you run into problems. You may also need a flathead screwdriver to pry out the old CPU if it is snug in its slot or socket. Don't forget to have the tools necessary to get the back cover off your system handy, as well; a Phillips screwdriver will usually do the job nicely.

Double-check the box that the CPU came in to make sure everything that should be included in the installation kit is there. If you notice something is missing, check with the retailer that you purchased the CPU from to get a new one or the missing parts. It will be much easier on you to check this before you get started as opposed to getting the CPU partially installed and noticing a pin is missing.

What's Your Style?

Use the charts below to help determine what packaging style your CPU is.

Intel	
Pentium	Socket 7
Pentium MMX	Socket 7
Pentium II	Slot 1
Pentium III	Slot 1 or Socket 370
Celeron	Socket 370
Xeon	Slot 2
Pentium 4	Socket 423
AMD	
K6	Socket 7
K6-2	Socket 7
K7 or Athlon	Socket A
Duron	Socket A
XP	Socket A

■ **The Upgrade.** Before you start the upgrade, make sure you back up all of your files to safeguard against losing data. To learn how to perform a backup, refer to the "Lessen The Possibility Of Data Loss" on page 119. Once you have completed the backup, turn your system off, unplug the PC, and let it sit for about 10 minutes to make sure it is cool.

Please remember the directions we are giving you are for a generic CPU upgrade. The instructions that came with your CPU may be different; in that case, you need to follow those instructions.

First, carefully remove your computer's cover. You may need to loosen several screws first, but it should slide off from the front in one piece. If you have not removed your computer's cover before, it may be tight at first and tough to get off, so be gentle with it and work it back and forth until it starts to slide.

Once you have the cover off, locate the CPU on your motherboard. Your CPU may have a heat sink fan attached to it, making it easy to spot. The heat sink fan prevents the processor from getting too hot, so be careful not to damage it if it is attached to the CPU. Some CPUs do not have a heat sink fan attached, so you'll

Before you start the upgrade, make sure you back up all of your files to safeguard against losing data.

need to look for the device that has the word "Intel" or "AMD" on it, or check your computer's manual for the CPU's location.

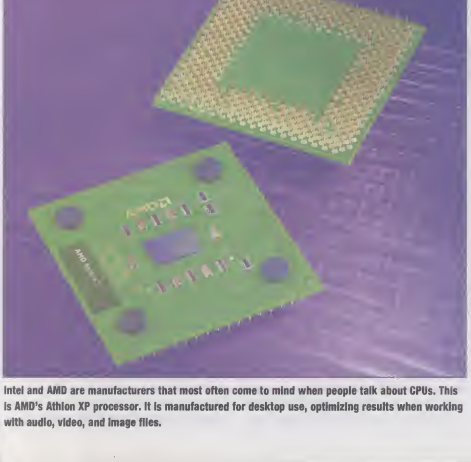
Next, make a mental note of the position of the CPU. As you remove it, remember the location of the first pin if it is a socket-style CPU. It will help you when installing the new CPU. Before reaching inside the case, be sure to ground yourself; put on your antistatic wristband or touch the side of the case.

Disconnect the cable that powers the heat sink fan, but leave the fan attached to the CPU. If your current CPU has a socket-style adapter, you will need to release the lever (called the ZIF lever; Zero Insertion Force) holding the CPU in place before trying to ease it out. If you can't get the CPU to come out, gently pry each side with a flathead screwdriver, but be careful not to damage the motherboard. If your current CPU has a slot-style adapter, it should have some sort of retention device securing it in place. Most retention devices resemble small clips or casings you can easily remove. Remove the retention device and slowly ease out the CPU; again, make sure the heat sink is still attached to the CPU. Place the CPU in a box to protect it and prevent any damage from static electricity.

Now, you need to make sure your motherboard is ready to receive the new CPU. If you have an older motherboard, you may need to configure the frontside bus speed and multipliers through switches on the motherboard. Check the documentation that came with your new CPU to locate the FSB speed and multiplier settings. Then check the documentation that came with your system to find out if you need to set the frontside bus speed and multiplier settings. These settings are probably already established on newer motherboards, but if they are not set on your motherboard, your users manual should explain the procedure.

After removing the old CPU and configuring your system, you are ready to install the new CPU. If the new CPU comes with a heat sink fan, attach it before installing the CPU. If the new CPU doesn't come with a heat sink fan, remove the one from your old CPU and attach it to the new one.

If you are installing a CPU with a socket-style adapter, make sure the pins are lined up correctly and that Pin 1 on the CPU is matched to the port for Pin 1 on the motherboard. Gently insert the CPU into place, be careful not to force it because you don't want any pins to break. If you break pins, it might void your warranty and the CPU will not work. Once the CPU is in place, lower the lever to secure it in place. If you are installing a CPU with a slot-style adapter, just slide the CPU into place and attach the retention mechanism to secure the CPU.



Intel and AMD are manufacturers that most often come to mind when people talk about CPUs. This is AMD's Athlon XP processor. It is manufactured for desktop use, optimizing results when working with audio, video, and image files.

■ **The Moment Of Truth.** The true test after installing any new component in your system is if it works when you plug your system in and turn it on. When you power up your PC, your system's BIOS (Basic Input/Output System) runs a check of the CPU and other system components. If everything checks out, your system will begin to boot. If the system boots correctly, you have been successful. If the system won't boot, turn it off, unplug it, and make sure you have the CPU placed on the motherboard correctly and the adapter is in place. Check other devices, as well, to make sure you didn't knock anything out of place while you were working. Also, make sure the heat sink fan is properly installed and running; if it isn't running, your system won't work correctly. Plug the system back in, turn the power on, and try booting again.

■ **Test The New Speed.** If you installed a CPU that only added a few megahertz to your system, you may not be able to see a huge difference in speed. But, most likely, if you went through the trouble of upgrading your CPU, the new CPU has an amount of increased speed that will definitely be noticeable. For example, upgrading from a 1GHz CPU to a 1.8GHz CPU will make a definite impact on your system.

Try out one of those new games that were sluggish before and see the difference a new processor can make. If you really want to make a difference in speed, you can update your RAM, hard drive, and graphics card, as well. If you're interested in updating your hard drive, check the "Out of Space?" article on page 138. To learn what more RAM or a new graphics card can do for your system, check out the *Smart Computing* Web site at http://www.smartcomputing.com to read articles on these topics. LS

by Mary Lafferty

Out Of Space?

What You Should Know About Buying & Installing A New Hard Drive

As we get older, we accumulate more stuff; it's the American way. We start out with nothing and have more than we know what to do with by the time we reach retirement. As our families get bigger and our possessions accumulate, we either move to a bigger home or add on to our existing one. The same is true in the world of hard drives. The more information we store on our computers, the fuller our hard drives become. Eventually, our drives get full and additional storage becomes a necessity.

The hard drive makes it possible for us to store and keep track of a lot of information at one time. The hard drive is the major memory bank of the computer; storing the OS (operating system) and everything else the system remembers when you turn your computer off. As technology advances and we perform more functions on the computer, we save more data. For example, 10 years ago people stored documents, calendars, and financial records on computers. Nowadays, people store movies, songs, and images on their computers in addition to documents, calendars, and financial records. As uses for the computer increase, the storage bank of the computer must also increase.

The easiest way to add storage is to delete programs or files you no longer use. If doing this doesn't free up enough space, it is probably time to upgrade your hard drive. Not only will a new hard drive add storage, but it could speed up your system, as well. The faster the drive accesses information, the faster your system will run.

Before you jump in your car and head to the local computer store to purchase a new hard drive, you need to have a basic understanding of how hard drives operate. Understanding the functions of a hard drive will help you understand the specifications, as well.

■ **About The Hard Drive.** Storing information to the hard drive starts with the OS. Information travels from the OS to the motherboard and through a large ribbon to the hard drive's cache buffer. The cache buffer is a storage unit for recently accessed data. Once the hard drive is ready to process the information, it searches the cache buffer for the data and sends it to the DSP (digital signal processor). The DSP converts the data from digital to analog. Tiny read/write heads write the data on spinning discs (called **platters**) that are covered in a magnetic sensitive coating. Platters are stacked, and a **spindle** (a rod that runs through the middle of the platters) holds them in place.

An actuator arm moves the read/write heads over the platters, making stored data accessible quickly. When the OS requests data from the drive, the actuator arm finds the proper **track** (one of many concentric rings that organize information on the platter) and **sector** (a portion of a track). The read heads read the data and send it to the cache buffer where the system can pick it up when it is ready for it.

■ **What To Look For.** Chances are you won't find any manufacturers advertising how many platters or read/write heads are in their hard drives. But understanding the functions of platters and read/write heads will help you recognize what you see advertised, such as interface, capacity, transfer speed, and average seek time.

Interface is the connection between the hard drive and the PC. The two common types of interfaces are IDE (Integrated Drive Electronics) and SCSI (Small Computer System Interface). You may see other interfaces, such as EIDE (Enhanced Integrated Drive Electronics) or ATA (Advanced Technology Attachment), which at one time distinguished different drives, but now they are all considered a type of IDE interface.

SCSI drives process information faster, but IDE drives are less expensive and easier to install than SCSI drives. For most home users, IDE is all you need, and it is what we recommend.

Capacity refers to how much data, measured in megabytes or gigabytes, the hard

drive stores. Current hard drives are available that store anywhere from 20GB to 200GB of data. Usually, a drive in the 80GB to 120GB range will have plenty of storage, and it will only set you back between $125 and $250. If you want to be the king of the mountain and go for the 200GB drive, you will need to have about $400 in your pocket.

Transfer speed is measured in MBps (megabytes per second) and tells you how fast the drive's cache buffer can transfer data to the computer. Transfer speed is written as ATA/100 or ATA/133. ATA/100 means the driver transfers data at 100MBps and ATA/133 means the driver transfers data at 133MBps.

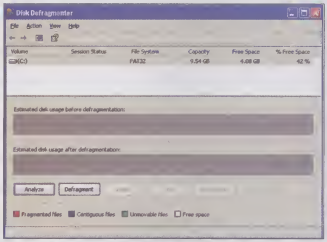
The transfer rate is good to know, but the true indicator of a hard drive's speed is the **average seek time** (the time it takes the actuator arm to position the heads) and **spindle speed** (how many times per minute the spindle makes a complete revolution) measured in RPM (revolutions per minute). Most hard drives on the market today have an RPM of 5,400 or 7,200 and an average seek time of about 8ms (milliseconds). The higher the spindle speed and the lower the average seek time, the faster the drive will be.

■ **A Few More Considerations.** Now that you know how to read the specifications of a hard drive, you need to make a few decisions before you replace a hard drive. First, do you want to purchase an external or internal drive? Secondly, do you want to replace your existing drive or work from dual hard drives?

Internal vs. external. Most systems have a 3.5-inch or a 5.25-inch internal hard drive. If you decide to go with an internal drive, make sure to check the dimensions of your current drive. You can purchase a special bracket for a 3.5-inch drive that lets you fit it into a 5.25-inch drive bay (the area in the computer that stores the drive). But you can't squeeze a 5.25-inch drive into a 3.5-inch drive bay.

You don't have to worry about size with an external hard drive, unless you are cramped for space on your desktop. External drives are easy to install and mobile. These are advantages you should consider if you need to transfer a lot of information regularly between systems. Most home users turn to an internal drive because it doesn't require any desktop space. In addition, you are less likely to damage an internal drive because once it is installed, you will probably never handle it again.

Dual vs. single. If your old drive no longer works, or your system only has room for one hard drive, you do not need to worry about whether you should replace your hard drive or add another. But if you are just upgrading your drive to add storage or improve performance, you might want to consider your options.



Access the Disk Defragmenter dialog box in Windows XP and you can monitor the defragmenting process.

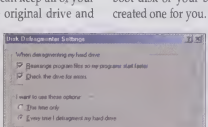
The biggest advantage to keeping your old drive is you don't have to worry about transferring or losing data. You can keep all of your files and programs on the original drive and start saving new files and programs to the new drive. In addition to convenience, added storage is a benefit. If your old drive holds 20GB and your new drive holds 80GB, you would have 100GB of storage to use by keeping your old drive.

We will walk through installation of a replacement drive, as well as installation of a dual drive. It isn't necessary to step through the installation of an external drive because this process usually only consists of plugging the drive into the appropriate USB (Universal Serial Bus) or parallel connection on the computer and installing the software.

■ **Let's Get Started.** Before you begin, make sure your workspace is clean, well lit, and roomy. Also, make sure all of the tools you will need are close by. We recommend having your system's users manuals handy, in addition to a couple of screwdrivers, a grounding device to protect against static electricity, and the new drive and everything that came with it. It is important to read through your new drive's installation manual prior to getting started and follow its instructions to the letter. We will walk you through a basic hard drive installation, but if the installation manual that came with the drive varies from our directions, you need to follow the manual.

Most importantly, make sure to back up your data before removing the old drive. Remember that your hard drive stores all your programs and data, so if you remove it without a backup, you will be starting from scratch when you install the new drive. If your old drive has already called it quits and you never performed a backup, you are out of luck. However, if your old drive is still working, refer to "Lessen The Possibility Of Data Loss" on page 119 to learn how to back up your system.

In addition to a backup, you need a boot disk to reboot your system after the installation. Your system should have come with a boot disk or your backup software may have created one for you.


Disk Defragmenter Settings
When defragmenting my hard drive:
Rearrange program files so my programs start faster
Check the drive for errors
I want to see these options:
The first time only
Every time I defragment my hard drive
OK
Cancel

To apply the settings for the disk defragmenter in Windows 98 and Windows Me, select the options you want from the Disk Defragmenter Settings dialog box and click OK.

If you are installing a second drive, make sure your system has the proper connections available. Most often, if you are installing an additional drive, it will be an IDE drive, so make sure you have an available IDE port. Most systems come with two ports, but if you don't have one available, you can purchase an adapter card that supports a new drive for about $50. A few good places to look for adapter cards are Belkin (http://www.belkin.com), Promise Technology (http://www.promise.com), and HighPoint (http://www.highpoint-tech.com).

Once you complete the backup, make a mental note or write down where each cord on the back of the system is plugged in. This will make it easier on you when you start to hook everything back up. When you're confident you can put everything back together, unplug the system from the power outlet and disconnect everything from the back of the system. Take the cover off the case by pulling forward and upward on it. Some covers are secured in place with screws, so you may need to remove the screws before trying to pull the cover off. Let the system cool for at least 10 minutes before removing the old drive.

To begin, remove the wide IDE ribbon cable and the 4-pin power plug from the old drive. You might have to wiggle them back and forth to get them out if they are snug in their spots. Be careful, though; you don't want to damage the connectors. Next, remove the screws holding the drive to the case. Carefully pull the drive out of the case; avoid bumping anything or pulling any cords out while you remove the drive.

You may also need to set a driver's jumpers. You can set a driver's jumpers to master mode or slave mode. Many drives ship from the manufacturer with the jumpers already set to master mode because most drives are the only one installed, or they are the primary drive installed. If you are installing a second drive, you will need to configure its jumpers to slave mode because your first drive is already configured as the master drive. Check the installation instructions that came with your drive to learn how to change the jumpers to slave mode.

Before installing your new drive, make sure you know exactly which way it fits in your case and which side is up. Handling a drive too much could damage it. Slide the new drive in where the old one came out, or if you are installing a second drive, slide it into the area where you determine it should go. Keep in mind that the hard drive gets warm while the system is running so you need to give the drive plenty of room for ventilation. Next, attach the ribbon cable and power cable. Make sure the red edge of the ribbon cable is in line with Pin 1 on the drive. If you are installing a second drive, attach the ribbon cable to a connector on your original drive's ribbon cable. Most cables have three connectors; you can attach the second drive into any open connector. Double-check the screws and the cables on the drive to make sure everything is secure and in place.

Plug the system in, place the boot disk in drive A, and turn the system on. Leave the cover off the chassis until you know the drive is working. You need to immediately press the key sequence required to access the BIOS (Basic Input/Output System) setup screen as soon as your system boots. In most cases you will press F1, F2, or DELETE, but you need to check your users manual to know for sure. If your BIOS screen gives you an option for Auto Detect, select it and continue. Follow the directions on your BIOS to make sure your hard drive is installed properly. There are a lot of different BIOSes out there, so it is hard for us to give you exact instructions from this point. If you can't figure it out, you may need to contact your hard drive or computer manufacturer to help you.

From this point, all you need to do is format the drive. Insert the installation hardware that came with your drive and follow the steps to complete formatting. Once you know the drive is working properly, put the cover back on the case and plug all of the components into the back of the system. Now, you are ready to install your OS or backup software.

■ **Keep Your New Drive Healthy.** Now that you have installed a new hard drive, you want to make sure it is maintained properly. The OS tries to avoid problems when it stores data, but problems do still arise. One of the most common problems is **disk fragmentation** (when clusters that make up a file are scattered throughout the drive). Disk fragmentation forces the OS to access multiple locations on the hard drive to retrieve one file. This slows your hard drive down and makes it hard to recover any lost files. A process called **defragmentation** rearranges the drives so all clusters of a file are together. You should defragment your drive monthly or weekly (if you use your computer daily) if you want to optimize performance.

To defragment your drive using Windows 98 or Windows Me, click Start, select Programs, Accessories, System Tools, and Disk Defragmenter. Select the drive you want to defragment and click Settings to open the Disk Defragmenter Settings dialog box. Select Rearrange Program Files So My Programs Start Faster and Check The Drive For Errors and click OK to close the dialog box. Click OK again to start defragmenting. For Windows XP users, click Start, select All Programs, Accessories, System Tools, and click Disk Defragmenter to open the Disk Defragmenter window. Highlight the drive you want to defragment and click the Defragment button to begin defragmenting. Keep in mind that defragging a drive could take hours, so it might be something you want to perform at night or during a time when you won't need the computer for a while.

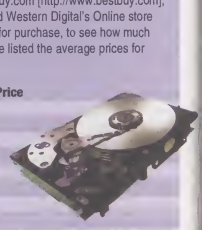
Once you have your files installed on your new hard drive, the installation is complete. Maintain your drive by defragmenting on a regular basis and it should be a long time before you have to install a hard drive again. LS

by Mary Lafferty

Internal & External Hard Drive Prices

We checked out several Web sites (including BestBuy.com [http://www.bestbuy.com], Circuit City [http://www.circuitcity.com/init.jsp], and Western Digital's Online store [http://www.wdc.com]), where hard drives are available for purchase, to see how much internal and external hard drives are selling for. We have listed the average prices for each drive, according to its size.

Size	Internal Price	External Price
20GB	$85	$189
40GB	$96	$200
60GB	$106	$210
80GB	$138	$225
120GB	$266	$300
160GB	$300	$375
200GB	$400	N/A



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VIDEO

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AC (alternating current)—An electrical current that regularly and systematically reverses, or alternates, its direction of travel. The direction in which an electrical current flows is referred to as its polarity. One cycle, or hertz, is complete when the current has made two complete changes of polarity; in other words, the current has traveled both directions.

BIOS (Basic Input/Output System)—(Pronounced bye-ose.) A special piece of software built into most computers. BIOS routines control the startup process of the machines and other basic functions such as the keyboard, display, and disk drives. On older computers, the BIOS is stored in read-only memory, which is not erased when the power to the computer is shut off. Newer computers store BIOS on flash ROM, which can be erased and rewritten if the user needs to update the BIOS program.

boot disk—A diskette that contains the necessary part of the operating system so the computer can boot up. Most computers with hard drives boot from that, but older computers might boot from diskettes in the A: or B: drive. It is a good idea to keep a bootable diskette handy in case something goes wrong with the hard drive, as most computers first check the diskette drives for bootable diskettes before checking the hard drive. A faulty hard drive can be bypassed this way.

DC (direct current)—An electrical current that flows in one direction. For example, batteries use direct current.

DDR SDRAM (double-data-rate synchronous dynamic RAM)—This type of memory effectively has twice the data transfer rate of standard SDRAM because it executes two instructions per cycle rather than one.

device driver—A program that lets a hardware peripheral, known as a device, communicate with a computer. Some device drivers, such as those for the monitor and keyboard, usually come with the computer, while others, such as those for an optical drive or a sound card, come packaged with their corresponding device. Device drivers, as well as updates for the device drivers, also can be obtained from the manufacturer of the component.

ESD (electrostatic discharge)—As the name implies, this is the sudden discharge of static electricity and can be a threat to a computer's internal components. A PC's internal components are very sensitive to static electricity, and if they are exposed to an unexpected ESD, the components could be damaged.

FAT (file allocation table)—The method DOS and Windows use to keep track of the contents of a disk. The table is a chart of numbers that correspond to cluster addresses on the disk. When users or programs request a file, the operating system searches from address to address in the FAT to find where a file's clusters are stored on disk. It then goes to the disk to collect each cluster of information.

form factor—The size of a device, in physical terms rather than capacity. It can be used to describe media sizes (such as 3.5-inch and 5.25-inch diskette drives), but is more often used to describe the size and layout of devices' cases. A form factor for a computer case or motherboard describes its dimensions, as well as its layout, such as the location of hard drives, optical and diskette drives, slots, and ports. Form factors for computer cases and motherboards can have descriptive names, such as the Baby AT form factor for motherboards.

IDE (Integrated Drive Electronics)—A standard used since the mid-1980s for connecting hard drives, optical drives, and tape drives to computers. IDE and its successor, EIDE (Enhanced IDE), are based on the original IBM PC ISA (Industry Standard Architecture) 16-bit bus standard. As many as two IDE devices can attach to a single IDE ribbon cable. IDE is also known as ATA (Advanced Technology Attachment), while EIDE is sometimes called Fast ATA. IDE differs from the SCSI (Small Computer Systems Interface) standard that is most often on Macintosh computers. SCSI is usually thought of as faster than IDE but more expensive and complicated to use.

NTFS (NT File System)—A file organizational system by which data is stored and accessed in a Windows NT operating system. NTFS offers better methods of data protection and file recovery than a FAT (file allocation table), the file system used in DOS, Windows 3.x, and recent versions of Windows. It also supports long file names.

RDRAM (Rambus dynamic RAM)—A memory standard that succeeded SDRAM (synchronous dynamic RAM). RDRAM, which runs at speeds of 600MHz to 800MHz, is much faster than present memory, which clocks at 100MHz to 125MHz (SDRAM) or 200MHz (SDRAM II). Two types of RDRAM, concurrent and direct, are in development. Concurrent is based on standard RDRAM and is the type currently deployed in console games and add-in cards. Direct RDRAM has more enhancements and runs faster than concurrent RDRAM. RDRAM chips require less voltage than conventional memory, and a single chip can supply as much as 128MB of memory.

Registry—A database that contains information about user preferences and system configuration in Windows 95 and later. The Registry contains information about which devices are attached to the computer and which drivers should be used with them. It also keeps track of file associations (which programs should be used to open which type of files) and user preferences, such as what the monitor resolution and Desktop pattern should be. Changes to the Registry are generally made through the Control Panel, not by users directly editing the Registry. To manually edit the Registry, the Regedit utility can be used. Extreme caution is advised when manually editing the Registry because errors in it can disable Windows and prevent the machine from booting.

SCSI (Small Computer System Interface)—(Pronounced scuz-zee.) A standard for parallel interfaces that transfers information at a rate as fast as 80MBps (megabytes per second). As many as seven peripheral devices, such as a hard drive and CD-ROM drive, can attach to a single SCSI port on the system's bus. SCSI ports were designed for Apple Macintosh and Unix computers, but also can be used with properly equipped PCs.

SDRAM (synchronous dynamic RAM)—A type of memory that can run at much higher speeds than conventional DRAM (dynamic RAM). The speed increase is achieved by synchronizing the memory with the computer's internal clock, allowing for speeds of as fast as 100MHz, at least twice as fast as some types of DRAM and as much as three times faster than others. DDR SDRAM (double-data-rate SDRAM) doubles the speed of SDRAM by accessing memory on both the rising and falling edge of the computer's clock instead of just once per cycle. In musical terms, it is akin to playing a note on the up and downbeat.

# #

1-2-3, Lotus, 59-60

A

A Slow Crawl: Rev Up Your Computer & Move It Into A Faster Lane, 18-20

Accelerated Graphics Port (AGP), 132

Active content, 50-53

Add/Remove utility, 18-20

Advanced Power Management (APM), 12-13, 14-17

Advanced Technology (AT) form factor, 129

Advanced Technology Extended (ATX), 129

Adware, 101-104

AGP. *See Accelerated Graphics Port.*

AIM. *See America Online Instant Messenger.*

AMD, 135-136

America Online Instant Messenger (AIM), 92-93

Antispam legislation, 99-100

Antivirus software, 8-10, 12, 18-20

APM. *See Advanced Power Management.*

Application layer, 83-86

AT form factor. *See Advanced Technology form factor.*

ATX. *See Advanced Technology Extended.*

Audio, 72-75

Auto-focus, 76-79

Automatic Update, 111

AutoRecover, 50-53

Average seek time, 139

B

Background applications, 18-20

Backup diskettes, 39-40

Backups, 119-121

Basic Input/Output System (BIOS), 8-10, 11, 13, 14-17, 21-23, 30-32, 39-40, 133, 137, 140; beep codes, 69

Batteries, 76-79, 125-127

Binary language, 134-135

BIOS. *See Basic Input/Output System.*

Blue Screen Of Death (BSOD), 108-112

Boot Failures & Startup Woes: What To Do When Your System Refuses To Boot Properly, 8-10

Boot, 8-10

Bootable diskettes, 8-10, 39-40

Broadband, 92

Browser cache, 71

BSOD. *See Blue Screen Of Death.*

C

Cables, 14-17, 122-124

Cache, 23, 132

Cache buffer, 138

Cache memory, 134

CD drives, 72-75

CD-ROM, 80

Check & Clean Your Registry: It's Time To Decontaminate The Central Database, 41-44

Chill Out: Ways To Cool Off Your Overheated PC, 36-38

Chips, 45-47

Clean boot, 111-112

Cleaning input devices, 5-7

Clock speed, 36, 135

CompactFlash, 76-79

Compatibility, 113-115

Computer maintenance, 5-7

Conflicts Among IRQs & Devices: Improve Communication & End Territorial Squabbles, 30-32

Cookies, 94, 101-104

Corel Office Suite Annoyances: Solutions To The Problems That Arise In WordPerfect & Quattro Pro, 54-57

CPUs, 132, 134-137

D

DACs. *See digital-to-analog converters.*

Data loss, 119-121

Data recovery, 116-118; third-party apps, 117-118

DDR SDRAM. *See double-data-rate SDRAM.*

Defragmentation, 140

Denial of service (DoS) attacks, 95-97

Device Manager, 12, 30-32

Digicams, 76-79

Digital Camera Crises: Deal With Digicam Problems, 76-79

Digital photography, 76-79

Digital Subscriber Line (DSL), 91

Digital-to-analog converters (DACs), 72-75

DirectX, 70-71

Disk Cleanup, 5-7, 18-20

Disk Defragmenter, 18-20, 110

Dolby Digital, 82

DoS attacks. *See denial of service attacks.*

Double-data-rate SDRAM (DDR SDRAM), 45-47

Driver conflicts, 42

Drivers, 8-10, 11-12, 14-17, 48-49, 71, 72-75, 82, 113-115, 122-124

DSL. *See Digital Subscriber Line.*

DVD drives, 80-82; installing, 81-82

DVD software decoders, 82

DVD-ROM, 80-82

DVD+RW, 80-82

DVD-RW, 80-82

E

Email filtering systems, 98-100

Emergency boot diskettes, 122-124

End System Freezes & Lockups: Break The Ice & Help Your Computer Recover From Frostbite, 14-17

Enhance Your Memory: Experience A Massive Performance Boost For A Mere Pittance, 45-47

Error messages, Windows, 108-112

Ethernet, 83-86

Exception errors, 109

Expansion slots, 132

External devices, 125-127

F

Fans, 14-17, 36-38

File recovery, 50-53

FilterKeys, 24-28

Firewalls, 93-94, 95-97, 101-104

FireWire, 24-28

Flash ROM, 21

Floppy diskettes, 122-124

Floppy diskette drives, 122-124

Free & Fee-Based Firewalls: Does Everything Of Value Have A Price Tag?, 95-97

Freezes, 14-17

From The Silver Screen To Your PC: How To Install A DVD Drive, 80-82

G

Gamepads, 24-28

Games, 70-71

Gateways, 91

Get The Picture?: How To Fix Common PC Video Problems, 69-71

Give Your PC The Boot: Create & Use Bootable Diskettes To Get Your System Back In Gear, 39-40

Graphics adapter, 69

H

Hackers, 95-97

Hard Drive Dilemmas: Solutions To Your Startup & Performance Troubles, 105-107

Hard drives, 18-20, 105-107, 138-140; internal vs. external, 139

Hardware, 113-115

Hardware incompatibility, 112

Heat sink, 37-38

Hibernation, 14-17

How To Replace Your Motherboard: Solutions For When Your Mainboard Gives You Troubles, 131-133

Hubs, 83-86

I

I/O port. *See input/output port.*

ICF. *See Internet Connection Firewall.*

ICQ, 93

ICS. *See Internet Connection Sharing.*

IDE. *See Integrated Drive Electronics.*

IDE/ATA. *See Integrated Drive Electronics/Advanced Technology Attachment.*

Illegal operation errors, 109

Image quality, 76-79

In Mint Printing Condition: Bounce Back From Inkjet & Laser Printer Problems, 33-35

Ink cartridges, 34-35

Input devices, 5-7, 24-28

Input/output (I/O) port, 22

Install A Power Supply: What To Do If Your System Loses Power, 128-130

Integrated Drive Electronics (IDE), 22, 138-140

Integrated Drive Electronics/Advanced Technology Attachment (IDE/ATA), 105-107

Intel, 135

Interface, 50-53

Internet Connection Firewall (ICF), 95-97

Internet Connection Sharing (ICS), 111

Internet Explorer, Microsoft, 92, 111

Internet security, 92-94

Internet service providers (ISPs), 98-100

Interrupt request lines (IRQs), 30-32

Invalid page fault, 109

IRQs. *See interrupt request lines.*

ISPs. *See Internet service providers.*

J

Joysticks, 24-28

K

Kernel errors, 109

Keyboards, 24-28

L

LCDs. *See liquid-crystal displays.*

Legacy Universal Serial Bus (USB) setting, 22

Legacy USB setting. *See legacy Universal Serial Bus setting.*

Lessen The Possibility Of Data Loss: Back Up Your System & Keep Your Data Safe, 119-121

Li-Ion batteries. *See lithium-ion batteries.*

Liquid-crystal displays (LCDs), 71, 76-79

Lithium-Ion (Li-Ion) batteries, 76-79

Lockups, 14-17

Logic gate, 134

M

Make A Connection: What To Do When You Can't Access The Internet, 88-91

Master boot record (MBR), 8-10

MBR. *See master boot record.*

MBTF. *See mean time between failures.*

Mean time between failures (MBTF), 129

Media cards, 76-79

Media key, 63

Media players, 62-64

Memory, 8-10, 14-17, 45-47

Memory modules, 8-10

Memory Sticks, 76-79

Mice, 24-28

Micro Advanced Technology Extended (microATX), 129

microATX. *See micro Advanced Technology Extended.*

Microsoft Knowledge Base, 72-75

Microsoft Office Mishaps: Combat & Overcome Its Bad Habits, 50-53

Microsoft Office, 50-53

Minimize Spam: Put Your Inbox On A Junk-Free Diet, 98-100

Modems, 88-91

Money, Microsoft, 66-68; installation, 66

MoneySide, 67

Monitors, 69-70

Motherboards, 36-38, 125-127, 131-133, 135-137; form factors, 132; onboard multimedia, 132

Mousepads, 24-28

Moving Picture Experts Group-2 (MPEG-2), 82

MPEG-2. *See Moving Picture Experts Group-2.*

MSN Messenger, 93

Mute, 72-75

N

Netscape, 92

Network interface card (NIC), 83-86

Network Nuisances: What To Do When Things Go Wrong, 83-86

Networks, 83-86

NIC. *See network interface card.*

Nodes, 83-86

Notebooks Go Mainstream: Learn How To Upgrade Your Notebook, 125-127

Notebooks, 125-127; display problems, 71

O

Office features, 50-53

Organizer, Lotus, 60-61

Out Of Space?: What You Should Know About Buying & Installing A New Hard Drive, 138-140

Outlook Express, Microsoft, 93

Outlook, Microsoft, 93

Overclocking, 14-17, 132

Overheating, 14-17

P

Paper jams, 34

Paradox, Corel, 56

Patches and updates, 11-12, 94

Patches, 8-10, 48-49, 50-53, 101-104

PC video troubleshooting, 69-71

PCI. *See Peripheral Component Interconnect.*

Peripheral Component Interconnect (PCI), 83-86, 132

Physical layer, 83-86

Pick Up The Pace: Replace Your Old CPU With One That Meets Today's Standards, 134-137

Plug-and-play devices, 30-32

Ports, 125-127

POST. *See power on self test.*

Power management, notebooks, 22

Power on self test (POST), 21

Power supplies, 128-130; form factors, 129; upgrading, 130

Power supply fans, 37

Power-saving techniques, 76-79

Prevent Common Compatibility Conundrums: Make Your Hardware & Software Run Correctly, 113-115

Print head cleaning, 35

Printer drivers, 35

Printer troubleshooting, 33-35

Processors, 36-38, 134-137

Q

Quattro Pro, Corel, 56-57

Quicken, Intuit, 66-68; backup folders, 66

QuickTime, Apple, 62-63

R

RAM, 45-47, 70

Rambus DRAM (RDRAM), 45-47

RDRAM. *See Rambus DRAM.*

RealOne Player, RealNetworks, 63-64

Reconcile Your Accounts: Move Past Common Money & Quicken Problems, 66-68

Recover Lost Data: Applications & Tips To Protect Your Files & Information, 116-118

Recycle Bin, 5-7, 116-118

Refresh rate, 70

Registry, 13, 18-20, 24-28, 41-44, 55, 88, 110; cleaning utilities, 42-44

Resolution, 70; printers, 35

Routers, 91

S

Safe Mode, 8-10

Scanners, 24-28

ScanReg, 42-43

SCSI. *See Small Computer System Interface.*

SDRAM. *See synchronous dynamic RAM.*

Shutdown problems, 11-13

Shutdown Shortcomings: Make Your Computer Wave Good-bye, 11-13

Shutters, 76-79

Small Computer System Interface (SCSI), 105-107, 138

SmartMedia, 76-79

SmartSuite, Lotus, 58-61

Smooth Operation: Regular Maintenance Keeps Your System Healthy, 5-7

Software, 113-115

Somebody's Watching You: Control Spyware & Adware, 101-104

Sound cards, 72-75, 82

Sound levels, 72-75

Spam, 98-100

Speakers, 72-75

Spindle speed, 139

Spreadsheets, 59-60

Spyware, 101-104

Standby, 14-17

Startup, 105-107

Startup disks, 39-40

Static electricity, 136

Stay Current With Windows Update: The Easiest Way To Update Selected Operating Systems, Applications & Drivers, 48-49

StickyKeys, 24-28

Synchronous dynamic RAM (SDRAM), 45-47

System bus, 132

System cooling, 36-38

System Restore, 11, 71, 108, 110, 112

System slowdowns, 18-20

T

TCP/IP. *See Transmission Control Protocol/Internet Protocol.*

Temporary files, 11, 117

Temporary Internet files, 5-7, 71

The BIOS' Role During Startup: How The BIOS & Your PC Work Together To Control System Settings, 21-23

The Day The Music Died: Troubleshoot Your Audio Issues, 72-75

The Dreaded Error Message: How To Minimize The Occurrence Of Windows Errors, 108-112

The Trouble With Lotus' SmartSuite: Problems & Solutions To Help You Get The Most From The Suite, 58-61

Thrashing, 18-20

Time To Tighten Security: Eliminate Common Holes Found In Software You Use While Online, 92-94

ToggleKeys, 24-28

Trackballs, 24-28

Transistors, 134

Transmission Control Protocol/Internet Protocol (TCP/IP), 83-86

Transport layer, 83-86

Troubleshooting audio, 72-75

U

Undelete, Executive Software, 118

Undeleting files, 116-118

UnErase Wizard, Norton Utilities, 117-118

Uninstall utilities, 43

Uninterruptible power supply (UPS), 24-28, 129

Universal Serial Bus (USB), 132; ports, 24-28

Upgrading, 113-115, 125-127

UPS. *See uninterruptible power supply.*

USB ports. *See Universal Serial Bus ports.*

USB. *See Universal Serial Bus.*

User errors, 8-10

V

VGA. *See Video Graphics Array.*

Video cards, 69-71

Video Graphics Array (VGA), 69

Viewfinders, 76-79

Viruses, 8-10, 18-20, 24-28

W

Water-cooled PCs, 38

When Floppy Diskette Drives Go Bad: Determine Whether To Update Or Replace Your Drive, 122-124

When Input Goes Kaput: Troubleshoot Mice, Keyboards & Other Devices, 24-28

When Media Players Won't Play: Cope With Headaches Found In QuickTime, RealOne Player & Windows Media Player, 62-64

Windows Media Player, 64

Windows Messenger, 93

Windows Registry Checker, 42-43, 110

Windows Updates, 48-49

Word Pro, Lotus, 58-61

Word processing, 54-61

Word, Microsoft, 58

WordPerfect, Corel, 54-57

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